BROOKLYN BOTANIC GARDEN

PLANTS & GARDENS

THE ENVIRONMENT AND THE HOME GARDENER

A HANDBOOK

BROOKLYN BOTANIC GARDEN RECORD

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AMONG OUR CONTRIBUTORS

WARREN BALGOOYEN, Naturalist, Teatown Lake Reservation of the Brooklyn Botanic Garden, Ossining, New York.

CARL H. BECKMAN, Professor of Phytopathology, University of Rhode Island, Kingston.

ANNETTE BOUSHEY is with the Nature Conservancy, San Francisco, California.

RUSSELL L. BRENNEMAN, New London, Connecticut, is an attorney with a special interest in conservation. President, Connecticut Resources Recovery Authority.

EDWARD C. CHILDS, Great Mountain Forest, Norfolk, Connecticut. State Forester of the Year (1976), he is also a home gardener with a keen interest in alpines.

RICHARD H. GOODWIN, Professor Emeritus of Botany and Director of the Human Ecology Program at Connecticut College, New London.

JANET OLIVER GYER, Clarksboro, New Jersey, is a wildflower enthusiast interested in the preservation of endangered species.

JANE HERRMAN is in charge of the Education Program, Morris Arboretum, Philadelphia, Pennsylvania. Former Instructor, Brooklyn Botanic Garden.

CRAIG R. HIBBEN, Chairman of Research, Kitchawan Field Station of the Brooklyn Botanic Garden, Ossining, New York.

ALICE HARVEY HUBBARD. At the time her article was written for the first *BBG Handbook on Conservation,* she was a frequent lecturer and writer on community improvement programs. Author of THIS LAND OF OURS.

ROBERT JOSEPHY, Bethel, Connecticut, is owner of Blue Jay Orchards. A former New York businessman with an interest in preserving what is left of the farmlands of the East. Article from an AAAS address presented in 1976.

MARGARET E.B. JOYNER, Associate Editor, Brooklyn Botanic Garden.

WARREN G. KENFIELD, a Connecticut naturalist, has had a long professional and personal interest in ecology.

FREDERICK MCGOURTY, JR., Editor and Associate Taxonomist, Brooklyn Botanic Garden.

JOHN MCPHEE, Princeton, New Jersey. Author of several books, including ENCOUNTERS WITH THE ARCHDRUID and THE PINE BARRENS, both published by Farrar, Straus and Giroux, N.Y. His environmental articles frequently appear in *The New Yorker.*

WILLIAM A. NIERING, Professor of Botany and Director of the Connecticut Arboretum, Connecticut College, New London.

ARTHUR H. ODE, Director of Horticulture, New York Botanical Garden, Bronx, N.Y.

DAN PIKE is with the Rocky Mountain Field Office of the Nature Conservancy, Denver, Colorado.

RICHARD H. POUGH, President, Natural Area Council (145 East 52nd St., New York, N.Y. 10022). Author of AUDUBON LAND BIRD GUIDE (Doubleday & Co., Garden City, N.Y.).

ZONA SPARKS, Brooklyn, New York, is a researcher for *Time, Inc.,* New York.

GEORGE R. STEPHENS is a forester at the Connecticut Agricultural Experiment Station, New Haven.

ANTHONY S. TAORMINA, Principal Fish and Wildlife Biologist, New York State Department of Environmental Conservation.

SALLY L. TAYLOR, Assistant Professor of Botany, Connecticut College, New London.

BETTY F. THOMSON, Professor Emeritus of Botany, Connecticut College, New London. Author of THE CHANGING FACE OF NEW ENGLAND.

J. T. WALKER, Chairman, Department of Plant Pathology, Georgia Experiment Station, (Experiment, Ga.) Former Plant Pathologist, Brooklyn Botanic Garden.

PAUL E. WAGGONER, Director, Connecticut Agricultural Experiment Station, New Haven.

BROOKLYN BOTANIC GARDEN RECORD

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THE ENVIRONMENT AND THE HOME GARDENER

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Staff for this issue:
FREDERICK MCGOURTY, JR., *Editor*
MARGARET E.B. JOYNER, *Associate Editor*
and the Editorial Committee of the Brooklyn Botanic Garden
VIOLETTE CONNOLLY, *Secretary of Publications*
ELIZABETH SCHOLTZ, *Director, Brooklyn Botanic Garden*

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Eleanor A. Schrawder

Virginia blue bells *(Mertensia virginica)* and cinnamon ferns *(Osmunda cinnamomea)* grace a woodland garden in spring.

LETTER FROM THE BROOKLYN BOTANIC GARDEN

Fifteen years have passed since the last BBG Handbook on conservation and the environment. A veritable revolution (literally a full turning) in ideas and approaches, though not necessarily accomplishments, has taken place, with a substantial portion of the American people becoming concerned, at times alarmed and perplexed, by the rapidity of use of our natural resources. The subject in one form or another is in the news every day, and will be for the remainder of our lifetimes.

So many reams of paper and thought, both often recycled, have been devoted to conservation and the environment that even a panoramic review can be a bit boggy. Therefore the Editorial Committee has decided to concentrate on several principles, practices and current examples of unusual interest for home gardeners, who themselves make up a fair portion of the larger public. Don't expect much environmental evangelism here. Basically it is better, we feel, to develop an idea of what gardeners can do in their own gardens and communities to further the noble causes. And there are many good tasks to be done.

The mood of many concerned people is pessimistic these days. What a wide range of problems there are—and how quickly they have developed. Unyielding conservationist David Brower, for example, relates world history to a time frame based on the six days of Genesis. Accordingly the creation begins on Monday and each day equals 666 million years. At 11:57 PM Saturday, man appears; just 1/40th of a second before midnight the industrial revolution begins. (See John McPhee's book, *Encounters with the Archdruid,* Farrar, Straus & Giroux, for a fine depiction of Browerian perspectives; for an antidote to pessimism consult the works of René Dubos.)

Nearly every grown person has poignant memories of a little portion of the 40th of a second—from our youth, the then-unpaved country road abloom with Canada lilies; pheasants nesting among the reeds in a wetland that is no more; the old pine woodlot now holding the four-wheeled refuse of the 1960's and even 70's. Much has been destroyed forever but, fortunately, much can still be conserved and, in some cases, be regenerated. Let us make the start once more, with good will.

Sincerely,

Frederick McGourty, Jr.

Editor

When farms and pastures are no longer used, in short order you see . . .

THE RETURN OF THE FOREST

Paul E. Waggoner and George R. Stephens

Three centuries ago European colonists beat back the forest from enough acres of eastern America to grow crops; when the farmers and traders became prosperous, cities grew in the cleared land. But about a century ago the need for cropland near the eastern cities began to decline because trains were bringing food from the more fertile lands to the west, and modern agriculture was producing more food from fewer acres. The son of the eastern farmer went west or found a job in a factory; his grandson found a job in an office; and the forest—which had not been completely eradicated—began to infiltrate untilled fields and ungrazed pastures. Today a succession of trees is spreading from the fencerows and woodlots into the abandoned fields and creating suburban forests.

This process has created more wooded acreage in the Mid-Atlantic and New England states than had existed at the close of the Civil War—despite the megalopolitan sprawl that extends from Boston, Massachusetts to Washington, D.C.

The course of the reoccupation by a succession of trees proceeds somewhat differently on a ridge and in a meadow and somewhat differently in New England and in Georgia. The process in Connecticut is illuminating, for the state lies in the heart of an urbanizing region; and the birches of Robert Frost's poems, red-cedar characteristic of Virginia, and tulip tree (from the Magnolia family) all appear in Connecticut's forests.

The Colonization Process

As soon as the plow and cow leave, the forest pioneers fly in. The light seeds of the birches and aspen blow in from any nearby stands and the heavy seeds of red-cedar and black cherry arrive via birds. These pioneers begin to colonize any abandoned field, and if they are mown down, soon pop up again. Finally when the mower tires the plants take firm hold and succession begins in earnest. It proceeds slowly but rapidly enough so that between childhood and adulthood you can see an old pasture become a thicket. Then a prolonged fight for survival sets in among the many hundred plants per acre to decide which will make the forest that succeeds the thicket.

Until the early part of this century foresters were far from certain what course succession would take after the appearance of the thicket stage. In 1927 the Connecticut Agricultural Experiment Station set up a study of four tracts of land that would eventually reveal the stages of succession in the suburban forest.

Red maple, ironwood (*Carpinus*), white oak, black birch and witch-hazel became the predominant species. Encompassed within these plots were old forest which had lost its dominant American chestnut to blight; forest that had been grazed and burned; and new forest that had arisen on fields tilled by a past farmer. A benchmark was thus established in forests that were beyond the thicket stage and if foresters kept the faith preserving the plots from man-made disturbance and coming back to count the trees, they could learn the natural succession in the mixed hardwood forests that surround many eastern cities.

In 1937, 1957 and 1967 the old maps were taken from the cupboards and tree growth and death and new arrivals in the forest were recorded.

In a botanical version of the adage that the rich get richer and the poor get poorer, the percentage of trees large enough to be called poles or saw timber increased from 9 percent in 1927 to 30 percent in 1967 in an average acre, while the total tree population per acre fell from 1,500 to 600 trees. The number of species, however, scarcely declined in 40 years

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Reprinted from *Natural History*, Vol. LXXXII, No. 9

M. Joyner

Red-cedar, sumac, birch, aspen and apple trees have invaded this meadow in only 15 years.

and only quaking aspen, butternut, red-cedar and black cherry disappeared from the original list of 37 species.

A fire on one of the tracts in 1932 arrested the succession and in an instant turned time back three decades. But the phoenix of the new forest rose, little changed, from the ashes.

Setbacks Help the Stragglers

The forest landscape, the view of the woods from far away, is the canopy. These tall trees absorb the greatest portion of the life-giving sunlight, and during the first three decades of the survey the canopy was increasingly dominated by oak. During the fourth decade, however, maple, birch, ash and the tulip tree increased their role in the dominant stratum of the forest, adding their colors and textures to the visual richness of the landscape.

The fourth decade was one of drought and defoliation by gypsy moths and cankerworms. A comparison of the dry decade with earlier ones on tracts that were not defoliated revealed no significant effects from the drought. However, defoliation, particularly severe on the oaks, did influence the forest. Where the trees were defoliated, the growth of the major species was at least halved, while the minor species, benefiting from the several weeks of sunlight reaching them through the barren branches of larger trees, grew faster.

Observations made in the affected plots for more than a decade revealed that a single defoliation did not increase tree mortality. But repeated defoliation doubled the mortality during a decade. Death was more frequent among oaks—the favorite food of several defoliators—than among maples or birches. This is one reason why the oaks have lost some of their dominance of the upper story of the forest.

The observations covering a period of more than 40 years have shown that an abandoned field is quickly invaded by such pioneer trees as junipers and birches, that within a decade a thicket has formed, and that a forest of a few hundred trees per acre eventually transforms the land into a wooded landscape. The composition of this forest differs from the thicket of 20 to 30 years previous only in the loss of a few pioneer species.

The forest once beaten back from much of the East has been advancing back into the metropolitan belt for more than a hundred years. Covering old corn fields and pastures, re-covering woods decimated by fire and disease, the process of natural succession is providing our children with a forest landscape richer than the one our fathers and grandfathers enjoyed. ✤

Glacier-pure water
fifty miles from New York:

THE NEW JERSEY PINE BARRENS

John McPhee

Bill said, "There ain't no place like this left in the country, I don't believe—and I travelled around a little bit, too."

"Could I have some water?" I said to Fred. "I have a jerry can and I'd like to fill it at the pump."

"Hell, yes," he said. "That isn't my water. That's God's water. That's God's water. That right, Bill?"

"I guess so," Bill said, without looking up. "It's good water, I can tell you that."

"That's God's water," Fred said again. "Take all you want."

* * *

Outside on the pump housing was a bright-blue coffee tin full of priming water. I primed the pump and, before filling the jerry can, cupped my hands and drank. The water of the Pine Barrens is soft and pure, and there is so much of it that, like the forest above it, it is an incongruity in place and time. In the sand under the pines is a natural reservoir of pure water that, in volume, is the equivalent of a lake seventy-five feet deep with a surface of a thousand square miles. If all the impounding reservoirs, storage reservoirs and distribution reservoirs in the New York City water system were filled to capacity—from Neversink and Schoharie to the Croton basin and Central Park—the Pine Barrens aquifer would still contain thirty times as much water. So little of this water is used that it can be said to be untapped. Its constant temperature is fifty-four degrees, and, in the language of a hydrological report on the Pine Barrens prepared in 1966 for the United States Geological Survey, "it can be expected to be bacterially sterile, odorless, clear; its chemical purity approaches that of uncontaminated rainwater or melted glacier ice."

In the United States as a whole, only about thirty percent of the rainfall gets into the ground; the rest is lost to surface runoff or to evaporation, transpiration from leaves and similar interceptors. In the Pine Barrens, fully half of all precipitation makes its way into the great aquifer, for, as the government report put it, "the loose, sandy soil can imbibe as much as six inches of water per hour." The Pine Barrens rank as one of the greatest natural recharging areas in the world. Thus, the City of New York, say, could take all its daily water requirements out of the pines without fear of diminishing the basic supply. New Jersey could sell the Pine Barrens' "annual groundwater discharge"—the part that at the moment is running off into the Atlantic Ocean—for about two hundred million dollars a year. However, New Jersey does not sell a drop, in part because the state has its own future needs to consider.

All the major river systems in the United States are polluted, and so are most of the minor ones, but all the small rivers and streams in the Pine Barrens are potable. The pinelands have their own divide. The Pine Barrens rivers rise in the pines. Some flow west to the Delaware; most flow southeast directly into the sea. There are no through-flowing streams in the pines—no waters coming in from cities and towns on higher ground, as is the case almost everywhere else on the Atlantic coastal plain. I have spent many weekends on canoe trips in the Pine Barrens—on the Wading River, the Oswego, the Batsto, the Mullica. There is no white water in any of these rivers, but

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they move along fairly rapidly; they are so tortuous that every hundred yards or so brings a new scene—often one that is reminiscent of canoeing country in the northern states and in Canada. Even on bright days, the rivers can be dark and almost sunless under stands of white-cedar, and then, all in a moment, they run into brilliant sunshine where the banks rise higher and the forest of oak and pine is less dense. One indication of the size of the water resource below the Pine Barrens is that the streams keep flowing without great declines in volume even in prolonged times of drought. When streams in other parts of New Jersey were reduced to near or total dryness in recent years, the rivers in the pines were virtually unaffected. The characteristic color of the water in the streams is the color of tea—a phenomenon, often called "cedar water," that is familiar in the Adirondacks, as in many other places where tannins and other organic waste from riparian cedar trees combine with iron from the ground water to give the rivers a deep color. In summer, the cedar water is ordinarily so dark that the riverbeds are obscured, and while drifting along one has a feeling of being afloat on a river of fast-moving potable ink. For a few days after a long rain, however, the water is almost colorless. At these times, one can look down into it from a canoe and see the white sand bottom, ten or twelve feet below, and it is as clear as an image in the lens of a camera, with sunken timbers now and again coming into view and receding rapidly, at the speed of the river. Every strand of subsurface grass and every contour of the bottom sand is so sharply defined that the deep water above it seems, and is, irresistibly pure. Sea captains once took the cedar water of the Pine Barrens rivers with them on voyages, because cedar water would remain sweet and potable longer than any other water they could find.

* * *

When I had finished filling the jerry can from Fred Brown's pump, I took another drink, and I said to him, "You're lucky to live over such good water."

"You're telling me," he said. "You can put this water in a jug and put it away for a year and it will still be the same. Water from outside of these woods would stink. Outside of these woods, some water stinks when you pump it out of the ground. The people that has dug deep around here claims that there are streams of water under this earth that runs all the time." ☘

White-cedar, black oak and pitch pine are the dominant Pine Barrens trees. Blueberries and wildflowers flourish in between.

Stephen K.-M. Tim

BOGGS LAKE: A NATURAL VERNAL POOL

Annette Boushey

One of California's most distinctive ecosystems is the vernal pool—a depression in the earth which fills with winter rains. As the water retreats during spring and early summer, concentric rings of brilliantly flowering plants appear in succession. Sometimes the pool evaporates completely, with a last blaze of color filling in the very center as the water vanishes.

Thousands of tiny, jewel-like vernal pools once lay scattered across California's Great Central Valley, which became a vast, fragrant flower garden every spring. With the development of this rich valley for agriculture, and the leveling of the land, most of these pools have disappeared.

Boggs Lake is an exceptional vernal pool which has long been recognized by scientists as a significant botanical locality. Spurred by reports of a proposed development on the site, the California Native Plant Society urged the Nature Conservancy to acquire the lake and its immediate surroundings. The Conservancy's Western Regional Office contacted the property's owner, the Fibreboard Corporation, to point out the need for preservation of the area. In 1972 the corporation, a forest products firm, donated 104 acres—Boggs Lake and a surrounding buffer—to the Nature Conservancy.

An Unusual Vernal Pool

Named for the man who once ran a nearby sawmill, Boggs Lake is set not in grasslands, as are most vernal pools, but in a forest of Douglas-fir, ponderosa pine, California black oak and madrone. The hills that surround the pool are volcanic in origin, and scientists believe the lake may have formed in a depression left unfilled by lava flow. It is believed that dating the underlying volcanic rocks may shed some new light on the rate of speciation—the rate at which life forms differentiate into new biological species.

Boggs Lake, located approximately 120 miles north of San Francisco in Lake County, covers nearly 100 acres after a winter of heavy rain. It supports a fine example of California's vernal pool flora—a distinctive and highly localized community which has adapted to survive the pool's extreme seasonal variation in moisture. A surrounding body of serpentine-derived soil is a further reason for the unusual flora. Such soil is toxic to many of the plants which would normally grow in this locality, forcing them to evolve adaptations not found in most other plants.

The Lake's Seasons

In spring, on the flowering slopes of Boggs Lake, three species of plants are found which are not known to exist anywhere else in the world: a species of hedge-hyssop (*Gratiola heterosepala*), the many-flowered navarretia (*Navarretia plientha*) and a species of dodder (*Cuscuta howelliana*). The pool's flowering rings also provide habitat for the southernmost specimens of at least two plants, and for many typical vernal pool flowers such as three kinds of *Downingia*, which make lovely mass displays.

If you were to visit Boggs Lake in the summer, you would come out of the forest onto a broad, grassy meadow, sloping like a dish down to a marshy area, full of tules (a variety of bulrush). Walking

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through the tules, parting them with your arms in front of you as they closed behind, you would suddenly come upon a place of open water covered in part by a mat of vegetation, with water-lilies floating on top and ducks paddling about. You might see other birds as well: grebes and rails, lovely white egrets and great blue herons feeding in the shallows. The richness of life, which has followed the water line all spring, is concentrated in summer in this inner circle, hidden in the tules and pondweed.

In this central open water some fascinating plants are found, including watershield (*Brasenia schreberi*) and bladderwort (*Utricularia gibba*) which was first described from a collection made at Boggs Lake. The reddish-purple water-shield pushes its flowers above the surface of the water to pollinate, and then closes the flowers to bring them back under the water. The leaves of this plant, which are covered with a thick gelatinous layer, are of such unusual composition that specimens were once sent to a scientist in Czechoslovakia who had asked to study them. The yellow-flowered bladderwort has evolved a perfect mechanical trap with which it catches tiny aquatic organisms under the water. Once trapped, the organisms decompose to form a nitrogenous food for the plant.

Boggs Lake is a place of inspiration to the layman as well as the scientist. To witness a complete natural system go through so dramatic a seasonal rebirth, bringing forth such a rich variety of unusual life forms, is an experience worth protecting. George W. Burgess, Chairman of Fibreboard Corporation, said of the corporation's donation of Boggs Lake: "We have recognized the desirability of preserving the lake and its rare flowers and are pleased to have been in a position to make this donation." ❧

The pool will often completely disappear by late August, only to fill by spring and be surrounded by wildflowers.

Fibreboard Corp.

SOUTHERN BAYOU IN THE MIDWEST

Daniel E. Pike

Illinois . . . the Prairie State. Two thirds of the glaciated Illinois landscape was once covered with the lushest prairies in the world. Now, except for a few scattered remnants, the prairie grasses and forbs have yielded to subdivisions, super-highways, and soybean fields.

However, the remaining prairies are not the only examples of significant ecosystems left in Illinois. Foresight has saved fragments of the state's dunes, bogs, burr oak groves and hardwood forests, and vast riverbottom marshes which once bobbed with migratory waterfowl.

Despite the wide diversity of natural areas in Illinois, some seasoned state naturalists were still surprised at the existence of the most recent acquisition by the Nature Conservancy's Illinois Chapter: the Little Black Slough. Located in Johnson County at the far southern tip of Illinois between the Mississippi and Ohio Rivers, the Slough's large stands of water tupelo and huge bald-cypress trees are more reminiscent of a Louisiana bayou than the traditional Illinois plains. The Little Black Slough is believed to be the last unprotected wilderness in the state.

Isolation No Drawback

The best way to observe the Slough is by wading, which is reserved only for the heartiest individuals. Deep water, impenetrable thickets of buttonbush, and cottonmouth water moccasins can spell disaster for the unprepared. However, if you canoe through Little Black Slough—preferably in the spring—you are struck by the remoteness of the quiet, murky Cache River backwaters and the surrounding wall of uniformly tall, straight, dark brown tupelo trunks. The total calm is broken only by chorusing bird-voiced tree frogs or the silent motion of a lone beaver or river otter as it glides through the swamp.

Although Little Black Slough stretches over nearly five miles of Cache River backwaters, and dominates the 2,500 acre preserve, it is far from being the only ecological treasure within the area. Between October and January—when the waters have receded—you can walk into Goose Pond, located on the northern edge of the preserve, and view a stand of huge bald-cypress trees. The immensity of the trees, which stretch as far as you can see, and the silence provided by the cypress' closed canopy is overwhelming.

Cypress "knees," the strange knobs that grow out of the roots and ring the trees, add to the eeriness of Goose Pond. It is believed that the irregularly-shaped stumps provide aeration to the root system during the many months the bald-cypress stands in water.

More Than a Bayou

If you continue your journey southeast from Goose Pond, roughly paralleling the main channel of the Cache River, you begin to ascend the west end of Wildcat Bluff, so named because the state's last bobcat sighting was here. The climb from the riverbottom to blufftop reveals one of the most striking changes in floral species in Illinois. The floodplain, riverbanks, and swampy sections of the preserve reflect communities unique to extreme southern Illinois. Much of the flora is far more representative of the Southern Coastal Plain. Chestnut oaks, cherrybark oaks, pin oaks, huge Drummond's red maples, and

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Reprinted with permission from *The Nature Conservancy News*, Vol. 26, No. 1.

The Nature Conservancy

Bald-cypress and water tupelo on the banks of the Cache River, Little Black Slough, southern Illinois.

overcup oaks line the Slough. Wildcat Bluff, on the other hand, is largely comprised of oak-hickory woods and dry prairie openings which are more conventional to Illinois. In addition, the steep 200-foot slope of the bluff is often interrupted by limestone or sandstone outcroppings up to 50 feet high.

Geologically, the entire area is a spur of the Ozark highlands. Isolated sandstone canyons and rugged wooded terrain surround the lowlands. A 70-foot cliff juts abruptly out of the middle of the Slough and marks the west end of Boss Island. The 500-acre island contains some of Illinois' finest old growth forest dominated by oak-hickory communities on the south-facing slopes and sugar maple and tulip trees on the north-facing slopes.

The Little Black Slough preserve, with its variety of topographies and diversity of natural types, harbors over 100 species of native woody plants, including 12 species of oak and 7 species of hickory. In addition, at least 15 species of the preserve's plants and animals are considered locally or nationally rare. Along the edges of Boss Island, the limbs of the upland oaks and hickories actually overlap with those of the bald-cypress and water tupelo growing from the swamp below—certainly a botanical rarity.

Two Owners Cared

The Little Black Slough primarily owes its protection to benevolent owners. Around the turn of the century, much of the timberland in southwest Johnson County was being accumulated by the Main family of Karnak, Illinois. The Mains owned a prosperous local sawmill. Though their business depended upon an adequate timber supply, they managed their logging operations with a balanced approach to man's needs and nature's integrity. Because the Mains never cut trees under 24 inches in diameter and always left at least one large tree per acre as a seed source, the few portions of the Slough that the owners did harvest retain old growth characteristics with minimal or no evidence of past disturbance. Out of respect for this unique area, the Mains left almost all of the Slough uncut.

In 1973, the property was sold to the West Virginia Pulp and Paper Company (Westvaco). Upon hearing of the sale, the state asked the Nature Conservancy to act on its behalf. A meeting of state officials, naturalists, and Conservancy representatives was called in Chicago by businessman and conservationist Gaylord Donnelley to discuss strategy. While the Conservancy staff and Mr. Donnelley met with Westvaco personnel, the Illinois Nature Preserve Commission inspected the Little Black Slough and delivered its verdict: it must be preserved. Westvaco agreed to sell Little Black Slough to The Nature Conservancy for $1.25 million, significantly less than the area's appraised value. Title was passed to the Conservancy, although funds are still being sought to complete payment. (Address: Illinois Chapter, The Nature Conservancy, 666 North Lake Shore Drive, Suite 1919, Chicago, IL 60611.)

The Little Black Slough is the largest single acquisition for conservation in Illinois history. It is appropriate that government, industry, and the private sector should join together in an effort to protect this significant reminder of Illinois' natural diversity and wild beauty. ☘

THE NATURE CONSERVANCY:
Volunteers Committed to the Future

If the Nature Conservancy hadn't called itself an "action organization, committed to results," someone else surely would. Since its founding in 1950 the Conservancy has been instrumental in the acquisition and care of over one million acres of ecologically valuable land in the United States including forest, mountain, prairie, shore and marsh land. This non-profit membership organization of both professionals and over 25,000 volunteers identify, purchase and preserve important natural areas and the animal and plant life indigenous or unique to them. They finance their projects, of which all but the most ecologically fragile are open to the public, with dues, contributions, grants and on-going fund-raising activities.

Another important Conservancy function is assisting and advising governments in land acquisition for preservation. One such project was successfully culminated in October, 1976, when the State of Mississippi bought a 32,000 acre refuge, once threatened by lumbering, which had first been acquired by the Conservancy from a timber company. These 30 miles of land along the Pascagoula River shelter such endangered wildlife as the Southern panther and a rare species of sawback turtle. Examples of projects now owned and maintained by the Conservancy include a vernal pool (p. 9) and a Southern bayou in Illinois (p. 11).

The Conservancy feels that land preservation is imperative, not just for today but for tomorrow, to provide for an environmentally stable, livable earth. The Conservancy also does something about it. For more information, write The Nature Conservancy, 1800 N. Kent Street, Arlington, VA 22209. ☘

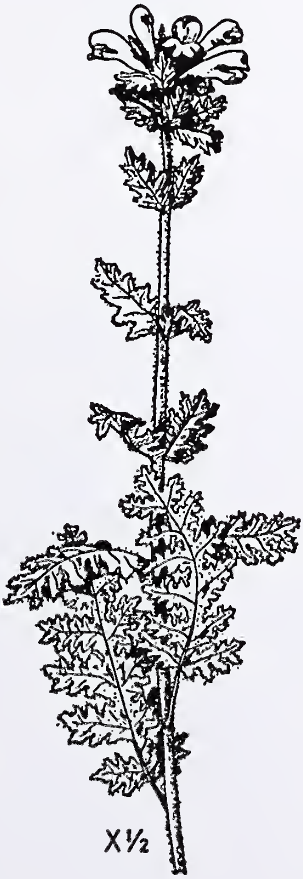
Our waning flora and the . . .

SAGA OF THE FURBISH LOUSEWORT

Zona Sparks

Gracing the banks of the St. John River in northern Maine, its hooded yellow blossoms nodding amid fernlike leaves, grows a rare wildflower that resembles a small snapdragon. It is called the Furbish lousewort (*Pedicularis furbishiae*), an unglamorous, positively non-euphonious name that has never been celebrated in verse or song. But this modest little plant, to the consternation of the Army Corps of Engineers, stands in the way of the proposed $668 million Dickey-Lincoln dam and hydroelectric project. Some 30 specimens of this herbaceous perennial, an endangered and threatened species scheduled for inclusion in the Endangered Species list of the Interior Department, were discovered last year not far from the wilderness setting in which they were first described by Miss Kate Furbish in the early 1880's.

Catharine—or Kate—Furbish, who gave not a fig for what proper Victorian ladies were supposed to do, dedicated a long lifetime to collecting, classifying and painting the flora of Maine. Born in New Hampshire on May 19, 1834, she grew up in Brunswick, Maine, where her father, a well-to-do merchant and manufacturer, introduced his only daughter to the botany of the region. After completing school in Brunswick she studied drawing and attended botany lectures in Boston, combining the two disciplines with the unfettered enthusiasm of the gifted amateur. In the spring of 1870 she set out on the monumental and solitary task of systematically cataloging the flora of her beloved Maine. A decade later the diminutive, inexhaustible "posy lady" was wandering through the swamps, woodlands and streams of the virgin Aroostook wilderness, often finding shelter in remote French or Indian villages.



New York Botanical Garden

Furbish lousewort *(Pedicularis furbishiae).*

Of her adventures she later wrote: "I have wandered alone for the most part, on the highways and in the hedges, on improvised rafts, in row-boats, crawling on hands and knees on the surface of bogs, and backing out, when I dared not walk, in order to procure a coveted treasure. Called 'crazy', a 'Fool'—and this is the way that my work has been done. The Flowers being my only society, and the Manuals the only literature for months together. Happy, happy hours!" It was in this manner that she discovered the atypical lousewort, not to be found in any then-existing manuals, that came to bear her name.

Kate Furbish continued her work until December 6, 1931, when she died of "cardiac hypertrophy" in Brunswick at the age of 97. Her watercolor drawings—16 folio volumes—were presented to Bowdoin College in 1908; her collection of dried plants, 4,000 sheets, went to the New England Botanical Club office at Harvard's Gray Herbarium.

Why Were They Given Such a Dreadful Name?

The louseworts are a large genus of marsh-loving plants of the *Scrophulariaceae,* or Figwort Family. *Pedicularis* is from the Latin for louse, and is thought to refer to an old European myth that livestock grazing upon plants of this genus were soon infested with lice. More likely, the environment that favors certain species is also congenial to the insect. The *wort* of the name is from the Anglo-Saxon word for plant, herb or root. The louseworts are of no present known economic importance, though one of them, the red rattle (*P. sylvatica*), appeared as a styptic in old herbals. It is incorrect to call the lousewort a snapdragon (genus *Antirrhinum*), though the euphemism is understandable, given the lousewort's inelegant name. In some manuals *Pedicularis* is called wood-betony, but it isn't a betony (*Stachys*) either.

Rediscovery Just in Time

In 1951 the Furbish lousewort disappeared from sight, perhaps, botanists thought, into extinction. Then, in 1976, Dr. T. K. Richards, University of Maine botanist and a consultant on the Dickey-Lincoln project, found some plants along the banks of the St. John.

The discovery was a thrill to the botanist but a thorn to the Army Engineers because Section 7 of the code governing the environmental impact of federal projects is very explicit in stating that the U.S. Government may not mark *finis* to an endangered plant or animal species.

The logical solution, to simply move the colony, is complicated at best because through some semi-parasitic relationship that is not fully understood, the Furbish lousewort is most particular about where it will grow; and herein lies some of the difficulty for the Dickey-Lincoln Dam. The plant can't be simply uprooted and transplanted to a new location.

End of Dam?

Maybe.

Maybe not.

According to Colonel John Chandler, New England Division of the Army Engineers in Waltham, Massachusetts, actual construction of the hydro-electric project is two or three years away. In the meantime the Department of Interior has been commissioned to study the "critical habitat" of Kate Furbish's little wildflower to determine its environmental needs. Possibly with further knowledge and tender loving care it can be transplanted to a congenial location, but this is a tricky business at best.

More ominously, from the scientist's point of view, the Department of Interior is seeking an amendment to Section 7 that would give the Secretary a discretionary override on conflicts of interest between public works and endangered species. Still more ominously, the federal restraint applies to federal projects only. The states and the private sector are not beholden to endangered species *per se*—only to specific species (*e.g.*, the bald eagle) with specific laws in their behalf. So there are loopholes aplenty.

But since there was a consulting botanist on hand in the early stages of Dickey-Lincoln, and because environmental impact studies are now a part of the political landscape, Kate Furbish's pretty little wildflower may yet be saved. And who knows what else? ❧

WHO'S PROTECTING ENDANGERED PLANTS?

Jane Herrman

Since the publication of the Smithsonian Institution's "Report on Endangered and Threatened Plant Species of the United States" and its subsequent appearance as part of the Federal Register (Vol. 40, No. 127; July 1, 1975), new attention has been focused on the problem of endangered plants in this country. Up to this point it seems that even ardent conservationists were more concerned with the status of members of the animal kingdom, so this recent look at flora is well deserved. However, we are a long way off from seeing any of the Smithsonian's suggestions turned into Federal law; this at the expense of many plants which may already be on their way to extinction.

It is with this in mind that an attempt was made to find out if there were any official listings by the fifty states of endangered plants and regulations against their destruction. Letters were sent to government agencies in all of the states in the hope that a compilation and comparison of lists could be made. The results have been discouraging.

Problems arose at the offset of the project. It was difficult in some cases finding out which state agency to contact. Many states have no departments of Natural Resources or Conservation, and some do not even have departments of Forestry or Fish and Wildlife. Only eighteen states sent any sort of list, and of these just four (New York, Vermont, Florida and Wisconsin) appear to have lists which are both "official" and clearly enforceable as law. The other lists have been issued by universities, garden clubs, extension services and conservation organizations.

Attempts to compare the lists produced further complications, ranging from typographical errors to varying uses of common names. Obviously, it does not make much sense to compare the flora of

Louis Buhle

The dwindling lady's slipper orchid (*Cypripedium acaule*).

Brooklyn Botanic Garden

Trollius laxus, a distant American relative of the European globe-flower, is an excellent candidate for rescue both for its rarity and its appeal.

New Hampshire with that of Arizona in order to obtain a nationwide consensus on what is rare or endangered. However, among the lists received, which were largely from the eastern part of the United States, there are certain species or plant families which appear repeatedly.

Plants of Increasing Rarity

Endangered orchids are mentioned time after time. They include *Calopogon*, fairy-slipper (*Calypso*), lady's slipper (*Cypripedium*), *Pogonia* and twayblade (*Listera*).

Although many ferns are common in the East, others occur infrequently, including adder's-tongue (*Ophioglossum*), spleenwort (*Asplenium*), walking-leaf (*Camptosorus*), Woodsia and grape fern (*Botrichium*). Another group of non-flowering plants, the *Lycopodium* genus, known to gardeners by such names as ground-pine, ground-fern and running-evergreen, is becoming rare in many areas. The long strands of them that are found creeping along the forest floor are easy to uproot and have long been popular in terrariums and as Christmas decorations.

Among the well known wildflowers that appear on several lists are ginseng (*Panax quinquefolius*), trailing-arbutus (*Epigaea repens*) and bloodroot (*Sanguinaria*), as well as certain species of Trillium, *Gentiana* and pipsissewa (*Chimaphila*). Woody plants frequently mentioned are native *Rhododendron* (including azalea), mountain-laurel and its kin (*Kalmia*) and holly (*Ilex*).

Why Plants Become Rare

Even this brief listing points out the many problems that must be dealt with. The first is that of changing environments, brought on either by natural forces or by man. Whether "natural" succession should be retarded is a somewhat philosophical question, but more often the real question is whether a bog should be drained to build a shopping center, a forest destroyed to put up condominiums, or a dam constructed to generate electrical power, all at the expense of plant life.

The second problem is that of the private collector. Largely as a result of the increased popularity of growing plants in the home, many people are uprooting rare orchids and ferns as well as other specimens for use as pot plants or in terrariums, frequently taking more than they will need and not realizing that many of these plants will not grow well indoors.

The third and most serious problem is

that of exploitation, a case in which large numbers of plants are being taken for commercial purposes with no regard for the survival of the species. Groups particularly affected by this "Make-a-quick-buck" attitude are the orchids, ferns, cacti and insectivorous plants, including pitcher plants, Venus fly-traps and sundews. From the information received, there seems to be little state protection of the latter two groups. Plants such as ginseng, which is used for its purported medicinal qualities, have become endangered simply because of their marketability. It is only through stringent laws and enforcement that a halt can be put to this sort of destruction.

Virtually all states have unintentional plant-protection regulations inherent in their laws concerning trespassing and stealing on private property. However, many endangered plants grow on state or federal land where there may be no effective protection. Before specific laws can be drawn up and enforced, a better job of education is needed. State governments can join with conservation groups, botanic gardens and other organizations to make people more aware of the endangered plant situation. Lists that do exist should be honed and made more readily available to interested citizens. Land containing rare plants might be acquired by the state, as it has in all too few instances, and set aside as a wildflower preserve. It should be realized that having a variety of plants is of the utmost importance in nature, that each plant occupies its own very specific niche, and that by obliterating even the seemingly least important species, we may be indirectly injuring ourselves.

Princess-pine or ground-pine *(Lycopodium obscurum)* has been over-harvested for holiday decorations.

Louis Buhle

The list which follows does not purport to be a complete catalog. It is based on inquiries made to the appropriate agencies in the fifty states, and responses varied considerably.

If readers can supply further information concerning their state's regulations, they are invited to contact the author at the Morris Arboretum, Chestnut Hill, Pa. 19118. ☘

State	*Responsible for List*	*State Law*
Alabama	Presented by Garden Club of Alabama; published by Alabama Department of Conservation and Natural Resources	Trespassing
Arkansas	Arkansas Natural Area Plan, Gary E. Tucker, Arkansas Polytechnic College	Unknown
Florida	State Law, 1971	Unlawful to carry or convey on public highway or sell in any place
Georgia	W. H. Duncan, University of Georgia	Unknown
Idaho	"Report of the Natural Areas Workshop," C. A. Wellner and F. D. Johnson, College of Forestry, Wildlife and Range Sciences, University of Idaho	Unknown
Michigan	John Beamon, Michigan State University	Fine or imprisonment
Minnesota	G. B. Ownbey, University of Minnesota	Unknown
Missouri	Missouri Department of Conservation and U.S. Department of Agriculture, Soil Conservation Service (1974)	Unknown
New Hampshire	Society for the Protection of New Hampshire Forests	Trespassing
New Jersey	D. E. Fairbrothers and M. Y. Hough, Department of Botany, Rutgers University	Unknown
New York	State Law, September 1, 1974	No picking or damaging of plants on private or public property without permission. $25 fine.
North Carolina	North Carolina State University	Unknown
Tennessee	Candidate species list by A. J. Sharp, Botany Department, University of Tennessee	Unknown
Texas	List by Texas Organization for Endangered Species	Unknown
Vermont	State Law, June 6, 1975	Permit or permission needed on public or private land. Picking limited to one plant or two cuttings, and only for scientific purposes.
Virginia	Co-operative Extension Service and Virginia Federation of Garden Clubs	Unknown
West Virginia	"Rare and Endangered Plant Species in West Virginia" by West Virginia Department of Agriculture	Unknown
Wisconsin	State Law	Endangered plants cannot be picked or dug.

OUR CHANGING LAKES

Warren P. Balgooyen

Eutrophic, eutrophication, eutrophism—this strange family of words applied to lakes and ponds was once the jargon of obscure technical journals. The popularization of these terms indicates that people are becoming aware of man-caused environmental changes and are concerned enough to master their meanings.

Eutrophic, of Greek derivation, means well nourished (literally, eu = "good" or "advantageous;" -trophic = "nursing," pertaining to nutrition). Like everything else in nature, lakes have a life span. As they age, they become increasingly eutrophic—rich in plant and animal life. The degree or rate of eutrophism depends on the surrounding environment and man's influence on it.

Eutrophism is caused by the addition of fertilizer to a lake from outside sources; the ecologists' term is "outside nutrient import." In a wilderness situation the import of nutrients from a lake's watershed is very small. A heavy forest cover slows down runoff and enables terrestrial vegetation to utilize those few nutrients that may be released in the environment. However, in an area extensively settled by man runoff is rapid. Nutrient-laden waters are not held in check, although the land receives many times more nutrients than does a wilderness watershed. Man contributes these extra nutrients via high-phosphate detergents, indiscriminate use of lawn fertilizers, improperly stored farm wastes, and the leaching out of soil nutrients from plowed or bull-dozed land. Another factor in eutrophication—overflow from septic tanks with inadequate or faulty drainage—is one of the major contributors in suburban areas.

Overfeeding Can Kill a Lake

Fertilizing a lake may be compared with fertilizing a lawn or garden. The result in both cases is more rapid plant growth and

Geometric patterns of fresh-water marsh grass.

Robert F. Sutton

increased yield. If a very large amount of fertilizer is applied to a lawn, the grass may "burn" or even die. However, the cause of a lake's "death" is more indirect. Lake Erie, for example, is so overburdened with fertilizer that there are now more plankton, algae and higher plant life than the lake can accommodate.

While few lakes have had a comparable overdose of fertilizer, the addition of lesser amounts increases the yield of plant life, accelerates eutrophism, and leads to the transformation of a lake into a marsh. Each year plant remains settle to the bottom. This material decomposes over a period of time and consumes so much oxygen that very little is left for the fish. Not all material decomposes at the same rate, and the parts which are slower to break down contribute noticeably to the bottom sediment, making the lake more shallow. The more plants there are in a lake, the faster it will fill in with organic, peat-like sediment.

Eventually, lakes can become marshes through the deposition of plant remains, sand and silt. A lake's life cycle may be speeded up from a wilderness norm of, say, 10,000 years to the point where a very real progression toward a marsh may be observed in a human lifetime. Can or should something be done to reverse the process?

The process of eutrophication can be arrested but not easily reversed, especially where pollution of lakes continues. To stop such pollution, people must be willing to forego high phosphate detergents, to restrict their use of commercial fertilizers and to maintain the efficiency of their sewage systems.

Attacking the problem at its source is the only sound approach. Yet it will not provide an immediate relief to the problem of eutrophication. Unless a lake has a high volume of water moving through it, it takes many, many years for excess nutrients to be purged. Lake Washington near Seattle is now a classic example of how some lakes can be restored. The success of Lake Washington is due in part to the natural advantage of a high volume of water flowing through it and providing a flushing action by which excess nutrients can be purged. Public education and cooperation cut down the input of nutrients and the lake cleansed itself.

The Brooklyn Botanic Garden's Teatown Lake near Ossining, New York, is an example of the problem in its more advanced form. The eutrophication process has accelerated to such a point that restoring the lake now would be loosely similar to restoring an old farm after it had grown up into woodland. It could be done, but not without close community cooperation, a considerable amount of time, and much money.

Weed Control Difficult, Risky

Control of weeds can be accomplished mechanically or chemically. Both methods have their good and bad points. Mechanical control—cutting or pulling the vegetation—is desirable because the plants can be harvested and removed from the lake. This helps to deplete the lake of its excess nutrients. The weeds contain nutrients which will only be recycled if they remain in the lake to decompose. However, dealing mechanically with the growth in a lake of any size is nearly as frustrating as mowing a lawn with a razor blade! Underwater weed cutting was tried at Teatown Lake with specially designed equipment. Even so, regrowth was so fast that the project had to be abandoned.

Chemical control, the other alternative, saves time and labor. However, the dead weeds and their nutrients remain in the lake to be recycled. Also, cost is often prohibitive. In a lake with an average depth of 4 feet, application of a standard aquatic herbicide at recommended dosage costs about $100 per acre. For example, to treat the 33 acres of Teatown Lake, which is less than 4 feet deep in many spots, would cost from $1,500 to $3,000, depending on the chemical used. Applications should be repeated each year to be effective, and it has even been suggested that two applications be made in a year. Such an expenditure, for a measure that is only temporary, is beyond many budgets. Copper sulfate, while much less expensive, will kill only algae. It will not

Children gathering pond life at Teatown Lake Reservation, an outreach station of B.B.G. in Ossining, New York.

directly affect higher plant life such as milfoil (*Myriophyllum*) and waterweed (*Elodea*).

Ecological effects must also be considered. Adding chemicals in any amount to an aquatic environment is a risky procedure, and to apply a herbicide at a level which is both effective and recommended is frequently difficult. Even when accomplished, a drastic reduction of plankton and invertebrate life is unavoidable. The base of the food chain is altered with widespread repercussions for different organisms. A lake is a food "factory" for many kinds of wildlife in its vicinity.

When one considers the economic and ecological risks to the control of aquatic weeds, one must ask—is it worth it? One may question whether it is always wise to interfere with a natural, albeit man-accelerated, process of change from lake to marsh. Marshes, too, are of value in providing food and habitat for wildlife. Unless the gradual loss of a lake's recreational value conflicts with one's particular interests, money might be better spent on pollution abatement than on weed control. At Teatown Lake, for example, water-based recreation is not considered as important as environmental education and wildlife preservation. In its present condition the lake is extremely rich in animal life and well suited to pond life studies. Because of the lake's sheltering weeds, an exploring child, with one scoop of a net, can obtain a wide variety of living organisms. On the other hand, a lake valued for boating and swimming is not of much benefit when it is choked with weeds.

It should be recognized that eutrophism of itself is not necessarily detrimental. No two lakes, of course, are alike. What is good for one may not be good for another. Whether aquatic weeds should be controlled depends on the intended use of the lake and, most important of all, what is desirable in the future. ☙

Wetlands are among the earth's most valuable and interesting natural resources

SALT MARSH-MEADOWS AND SPONGY BOGS

Anthony S. Taormina

Wetlands are the special kind of places that are difficult to enjoy and appreciate without getting your feet wet. Consequently, many wetland "experts," whether age 4 or 40, can be distinguished by their grubby pants, muddy boots and soggy socks. Possibly, you qualify as a member of this distinctive group. If so, you know that wetland areas are among the earth's most valuable and interesting natural resources. In New York, these specialized areas are spattered all over the state in a multitude of forms. They vary from the lush salt marsh-meadows and tidal flats of Long Island, through the sedge and cattail covered backwaters of the Mohawk-Hudson, over the spongy bogs of the Adirondacks and even to the relatively barren groves of American elm and red maple that dominate many seasonally soaked, poorly drained soils. Though wetlands are usually embellished by a great variety of plant communities, their unifying characteristic is a normal or periodic covering of shallow water that can be either salt or fresh, muddy or clear, clean or polluted.

Plant Food Factories

Through the process of photosynthesis, an acre of cordgrass-covered tidal marsh converts far more carbon into organic compounds (proteins and carbohydrates within the plant tissue) than does an acre of sphagnum moss and black spruce growing in a cold Adirondack bog. Ultimately, when the several tons-per-acre crop of cordgrass is decomposed by hosts of specialized micro-organisms, the nutrients that were stored in the plant tissue are released to further enrich and season the salty soup of the sea. Once in the soup, tiny microscopic plants (phytoplankton) can utilize the nutrients to grow, reproduce and finally be fed upon by slightly larger animals (the zooplankton).

Comparable to the relationship between foxes and rabbits, there are carnivorous zooplankton that eat the grazers, grow fat, reproduce and become a key food source for the hungry myriads of small finfish, shellfish, crustaceans and other invertebrates.

The less salty soups concentrated within many fresh water wetlands are also enriched by their plant food factories. The food chain nourished there includes plankton, dragonflies, frogs, bass and wood ducks. Moreover, there are nutritious parts of many species of fresh water plants which are quite palatable to birds and mammals and consumed on the spot. What wetland watcher hasn't seen muskrats munching on cattail roots; black ducks scooping up sedge seeds, Canada geese grazing on the soft stems of rushes or wading deer contentedly chomping on water lilies?

Not Just a Restaurant

As with people, animals need more than food in order to survive. They also need shelter. Fortunately, most of the plants associated with wetlands serve this role, too. A blade of eelgrass is seen to be a zoological mini-garden when scrutinized under a microscope. A lily pad becomes a giant hatch cover when it shields a frightened frog. Swirling tangles of pond weeds provide seclusion to innumerable fish and insects. Did you ever notice how quickly a brood of frightened young ducks can disappear into the protective custody of brushy shorelines? Without such handy shelter, it is unlikely such young wildlife could survive for long no matter how well

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M. Joyner

Half a mile inland from Long Island Sound, this small tidal inlet is part of a vast water-holding marsh-meadow complex.

fed. Obviously, then, wetlands are of the utmost importance to us because they are basically prospering communities of plants and animals. Such communities rank among the finest endowments bequeathed to us from our natural heritage. If safely kept in our land bank, our wetlands endowment will continually reward us with rich dividends of a multitude of renewable plant and animal crops, including most of our Atlantic fish populations which are dependent upon wetlands during their life cycle.

However, not all wetland communities are equally prosperous and appearances can be deceiving, in particular the many roadside wetlands which are ablaze in August with the spectacular blooms of purple loosestrife (*Lythrum salicaria*). Recently, this exotic beauty has become a pest that has invaded many inland wetlands crowding out native aquatic plants far more valuable to fish and wildlife. Similarly, the common reed, *Phragmites*, with its attractive feathery plumes, is another highly aggressive plant which dominates many wetland areas including many disturbed zones along the marine edge. Furthermore, there are some wetlands such as elm-maple swamps on clay soils and salt meadows above mean high tide which because they are only occasionally flooded produce nuisance crops of mosquitoes.

Important Benefits to Man

In addition to the obvious biological productivity, wetlands provide us with many other values including naturally efficient tertiary sewage treatment systems. Plants in order to grow require phosphorus and nitrogen—nutrients which are excreted profusely in feces and urine. More often than not, these valuable waste products of animal metabolism end up fouling waters rather than nourishing upland plants. Fortunately, moored in our wetlands are the flotillas of wetland plants which come to our rescue as they capture some of the vagrant nutrients for their own use, thereby helping to cleanse our waters of a growing nuisance.

Important Benefits to Man

Everyone knows that storms and floods are normal occurrences. But somehow we tend to overlook the equally normal need to have such flood and storm waters absorbed and temporarily stored within wetland basins which serve as gigantic blotters and buffers protecting our adjoining upland developments from damage while also capturing and storing eroded sediments and detritus. The usefulness of wetlands as flood plains, however, flows in direct proportion to whatever good sense we demonstrate in restraining developments in these areas.

Wetlands provide us with a number of other values which are less tangible. They are living outdoor laboratories and classrooms for research and education which offer unlimited opportunities for imparting environmental values to those free spirits who don't mind getting bogged down in the mud.

Wetlands are also fun places where depending upon your chosen life-style you can enjoy such diverse pastimes as listening to the spring mating calls of frogs and toads, studying the peculiar feeding habits of the pitcher plant, hunting for a brace of mallards, trapping muskrats, photographing a nesting redwing, admiring the fishing technique of an osprey, quietly canoeing or just plain goofing off. ☘

Louis Buhle

The grotesque beauty and unusual style of the pitcher plant (*Sarracenia purpurea*) make it a desired ornamental. Unfortunately, because it is a bog plant, it does not often survive in the garden.

Shadblow or serviceberry *(Amelanchier)* flourishes on the flood plain of a small river.

Robert F. Sutton

Some Wetland Definitions

Connecticut Arboretum *Bulletin* No. 17, June, 1970.

Wetland: Any area that is more or less regularly wet or flooded, where the water table stands at or above the land surface for at least part of the year. These are distinguished according to the condition of wetness and the resulting type of vegetation into marsh, swamp and bog.

Marsh: An area normally covered with shallow water the year round. Typical marsh vegetation is rooted in the underwater soil and may be totally submerged, float at the surface, or emerge above the water. Characteristic marsh plants are water-lilies, pond weeds, cattails, sedges, arrowhead, and marsh-marigold.

Swamp: An area that is flooded or waterlogged in winter and early spring, but usually dry at the surface in summer. Ordinarily it is covered with wet-tolerant trees and shrubs. Typical are red maple, black gum or tupelo, willow, alder, sweet pepperbush, and highbush blueberry.

Bog: This develops in an essentially undrained depression with no outlet or where outflow is drastically impeded. Normal decay is extremely slow, and dead organic matter accumulates as peat. The water is cold, strongly acid, and practically devoid of oxygen and available nitrogen. Bogs harbor a distinctive group of plants that includes many members of the heath family such as cranberry, leatherleaf, and Labrador-tea, as well as the insectivorous pitcher plant and sundew. Typical trees of northern bogs are tamarack and black spruce, while southern white-cedar is most common in southern bogs. Also typical is sphagnum or bog moss that forms a thick, spongy, water-holding mass in which other plants may find a root-hold.

Floodplain: A flat, low-lying area bordering a river or stream; not strictly a wetland, since it is flooded only at times of very high water. All rivers flood periodically, however. In fact, it is the silt deposited during flood stages through the centuries and millennia of which the flood plain is constructed. One can expect that floodplains will continue to be flooded at intervals, a fact that should be considered in deciding how they are to be used.

An ecological approach to . . .

THE AMERICAN LAWN AND ITS ALTERNATIVES

Arthur H. Ode

The saga of the American lawn relates an odyssey from status symbol of the '50's and '60's to whipping boy of the energy-desperate present. Today's lawn can not only be excessively consumptive of fossil fuels and fertilizers, but indiscriminate use of herbicides and pesticides can be both a health hazard and ecologically damaging. On the other hand, expanses of healthy, traditional turf are necessary to the urban landscape as people places, as athletic fields, and as an integral aspect of traditional architectural processes. In addition, the role of the lawn is significant, particularly in urban areas, in the production of oxygen and reduction of carbon dioxide as well as temperature and humidity amelioration.

The more vociferous environmentalists of today, justifiably decrying the ecological unsoundness of modern lawns, conveniently forget that yesterday's lawn, using organic manures and hand lawn mowers, was the very epitome of ecologic responsibility. In fact, until fairly recently, the Central Park Sheep Meadow in New York was just that. In order to return to yesterday's lawn, the lawn of today will necessarily be scaled down in size. One of the most important factors in the ecological unsoundness of today's lawn is, in most cases, its sheer size. If we accept the premise that a lawn is not (as many would have us believe) evil, we may then rationally decide how to whittle it down to reasonable proportions.

What's Really Necessary?

According to standard guidelines, the traditional lawn should be mowed frequently enough so that no more than 1" of growth is removed per cutting. During good growing weather a high-maintenance lawn might need to be mowed two or more times per week. But what about marginal lawn areas where appearance isn't that important? Smart professional managers have designated high, medium and low maintenance areas, mapped them and managed them according to need. High maintenance areas are mowed when 1" of grass must be removed, medium areas are mowed perhaps six times per year, and low areas perhaps three times. The energy and labor savings are obvious; done properly there are few complaints. Large suburban home lawns can be similarly treated.

Defining what areas, of necessity, should be lawn and maintaining them efficiently with the proper equipment and expertise, especially as regards large public areas, is mandatory. Those areas not absolutely necessary as lawns, on either public or private property, must be maintained in some other way. We must learn to accept the random dandelion gracefully and to appreciate the true color of grass, rather than the super-fertilized hues of the recent past. In addition to the above-mentioned maintenance regimes, there are three distinct alternatives to the traditional lawn: return to woodland, either through replanting or natural succession; meadow maintenance; and prairie or meadow restoration.

Encouraging Woodland Development

Throughout most of the northeastern United States, woodland, specifically the deciduous forest ecotype, represents the climax vegetational regime. Boreal forest in the Far North or mountain areas and bog and dune vegetation are some relatively minor variations. In general, secondary succession in the Northeast leads to woods. A lawn area left unmowed will return in a number of years to an approximation of native forest. Evidence of this trend exists throughout the area. Marginal farmland, abandoned in Pennsylvania, New York, Connecticut, New Jersey and

Lupines naturalized in a New England meadow which is mowed only once a year, in October.

other northeastern states in the 1930's, '40's and later, is well on its way toward a return to vegetational conditions extant before Colonial times. Exact species composition may not be similar but the general aspect certainly is returning. In these areas abandoned farm fields, outlined by the omnipresent stone walls, are barely discernible through the new woodland. If the natural return to woodland via succession is not deemed suitable in a given lawn area, planting of native species can hasten the results. In either case, unnecessary lawn areas are effectively eliminated.

Meadows by Mowing

A lawn mowed several times a year is still a lawn; a lawn unmowed will undergo secondary succession, leading eventually to a climax vegetation type appropriate for its locale, be it woodland, prairie or other. Lawn mowed once in the fall of the year, or burned periodically where possible, will be maintained in meadow. Mowing or burning, only occasionally repelling woody vegetation, encourages the establishment of sun-loving wildflowers such as sunflowers, goldenrod, asters, species of milkweed and many others. Although the grass species composition may remain similar for long periods of time, they will have an entirely different aspect when ummowed. Even bluegrass will attain heights of a foot or more, seasonal color changes will be apparent, and wind motion and flowers and seeds will be evident. The effect can be very pleasing, particularly after a season or two, and the savings in fuel and labor are self-evident. In addition, such lawn-turned-meadow areas become refuges for ground-nesting birds and small mammals, which in turn foster the return of hawks, owls, foxes and other predator species. This approach has been demonstrably successful on thousands of acres of public rights-of-way, as well as small patches of home lawn. Regardless of size, it can add a necessary element of diversity to the landscape.

Prairie Grasslands

From Indiana to the Rockies, from Saskatchewan to Texas, there once existed the great American prairies. These grasslands differed from one region to another according to climatic and soil variations, but the presence of grass and the absence of trees throughout these vast areas separated them definitely from forested regions. Much of the prairie has been farmland for a century and much has been lost or degraded through overgrazing. However, enough relicts remain to indicate what once existed and a mammoth effort has been made, particularly since the disastrous days of the dust bowl, to reintroduce native species on grazing lands. Recent years have witnessed a phenomenal upsurge of interest in prairie on the esthetic as well as scientific level and it is now possible and practical to turn lawns into prairies. Although the process requires some prior investigation on the part of the homeowner or land manager, seed of both grasses and wildflowers are now available commercially and every major midwestern university or botanical garden can provide direction. There is a particular mystique associated with the prairie; the beauty of the grasses, legumes, and composites is unsurpassable. Yet there is another, more abstract, dimension involved. The prairie as a factor in American history lasted only a generation or two from discovery to virtual extinction. Perhaps it is this factor which lends it its aura of mystery and appeal and encourages so many valiant attempts at restoration. Once established, the prairie as substitute for lawn is undeniably superior both esthetically and ecologically in very many instances, and the future will see parklands, roadsides, suburban and even urban lawns so transformed.

The alternatives, some more practical than others, to the American lawns are as numerous as the native plant communities, and in many situations the traditional lawn should be retained. The primary consideration in an ecological approach to the American lawn should be keeping an open mind, considering human needs on one hand and ecosystem needs on the other, and working toward an end result which minimizes modern man's impact upon the environment. ⁂

The Invaders

The majority of garden and wildlife plants are benign, keep-to-one-spot kinds, but the homeowner must be on guard with a few very aggressive ones that don't know their place and consider the world their oyster. Japanese honeysuckle (*Lonicera japonica*) is one that has trackfooted its way from fence post to fence post and considerably beyond. Kudzu (*Pueraria lobata*), the travels of which were recounted with marvel, horror and rueful humor in Joel F. Blackwell's article, "The Vine That Ate the South"(PLANTS & GARDENS, Winter 1974-75, Vol. 30, No. 4), has transformed a portion of the Sunbelt and is the dominant and sometimes sole plant on many a Georgia acre. It can no longer be eradicated, and substantial economic loss has occurred.

Japanese barberry (*Berberis thunbergii*), though it doesn't travel at quite the rate of an SST, is another plant that has brought countless curses to the lips of otherwise even-tempered gardeners and farmers.

Recently we talked with a man who was probably the first to plant Oriental bittersweet (*Celastrus orbiculatus*) in his neighborhood, some 40 years ago. He eventually forgot about it and moved to another spot several miles away in the same community. This beautiful but insidious vine has since become established in his current garden, thanks to the birds who eat the fruits and drop the seeds in disregard of man's territorial limits. The gardener rues the day that he planted Oriental bittersweet but doesn't talk about it much with neighbors. He just thinks a more appropriate name for the vine would be strangler-of-the-North.

Ironically, there would have been no problem if our friend had planted American bittersweet (*C. scandens*), a less aggressive species. The flowers (hence fruits) of the native kind occur only on terminal shoots, whereas those of Oriental bittersweet occur from the axils as well. It's as simple as that—there are more fruits for the birds in the showy *C. orbiculatus,* and thus a greater chance for the plant to spread beyond bounds. The bittersweet decision of the cautious gardener is to choose the less conspicuous *C. scandens* so he won't endanger his neighbor's garden (and good will). It is no help that the two plants are thoroughly confused in the nursery trade as well.

The annals of plant aggression are replete with similar case histories. Many of America's common weeds were introduced as accidents, or at least with the best intentions. The brief but important moral is to learn about a plant's naturalizing abilities before purchase. ⁂

SOURCES OF INFORMATION

Advice on various aspects of conservation programs and problems is available from national, state and local organizations. In a plea for funds for some of the most active of the national groups, Richard H. Pough, President of the Natural Area Council, has listed sixteen membership organizations. While all will welcome support, they can be expected also to welcome inquiries as they are happy to help smaller groups to get started on worthwhile projects in conservation. All, Dr. Pough points out, are deeply concerned with one or more aspects of the preservation of open space around our growing cities.

America the Beautiful Fund, Inc., 145 East 52nd St., New York, N.Y. 10022 212-486-1907.

American Forestry Association, 1319 18th St., N.W., Washington, D.C. 20036 202-467-5810.

Defenders of Wildlife, 1244 19th St., N.W., Washington, D.C. 20036 202-659-9510.

Environmental Defense Fund, Inc., 162 Old Town Rd., East Setauket, N.Y. 17733 516-751-5191.

Friends of the Earth, 72 Jane St., New York, N.Y. 10014 212-675-5911.

Izaak Walton League of America, 1800 N. Kent St., Suite 806, Arlington, Va. 22209 703-528-1818.

National Audubon Society, 950 Third Ave., New York, N.Y. 10022 212-832-3200.

National Park and Conservation Association, 1701 18th St., N.W., Washington, D.C. 20009 202-265-2717.

National Trust for Historic Preservation, 748 Jackson Place, N.W., Washington, D.C. 20006 202-393-3664.

National Wildlife Federation, 1412 16th St., N.W., Washington, D.C. 20036 202-797-6800.

Natural Science for Youth Foundation, 763 Silvermine Rd., New Canaan, Conn. 06840 203-966-5643.

The Nature Conservancy, Suite 800, 1800 N. Kent St., Arlington, Va. 22209 703-524-3151.

Open Space Institute, Inc., 145 E. 52nd St., New York, N.Y. 10022 212-421-0732.

Sierra Club, 530 Bush St., San Francisco, California 94108 415-981-8634.

The Wilderness Society, 1901 Pennsylvania Ave., N.W., Washington, D.C. 20006 202-293-2732.

World Wildlife Fund, 1319 18th St., N.W., Washington, D.C. 20036 202-466-2160.

Names and addresses of state and local as well as national organizations will be found in the Conservation Directory issued by the National Wildlife Federation, 1412 Sixteenth Street, N.W., Washington, D.C. 20036. Copies are available for $3.00 each.

HOW PLANTS FIGHT BACK

They have defenses against their own 'sore throats'

Carl H. Beckman

When we humans get a sore throat, a cut or a blister, the reddening or inflammation that appears is part of a process of defense and healing. Without this process, we would die from the slightest injury or infection.

So it is, also, with higher plants. Although they differ in many respects from warm-blooded animals, many of their cellular functions are similar. Plants are beset by all sorts of injuries that become infected. Roots become chewed by insects, torn by golf shoes and hoes, while stems are cut and punctured and torn by high winds, by sap-suckers, by apple pickers and by little boys with jackknives. All of these injuries become readily infected. Plants have their own systems of defense, however. Without them, tomatoes and cabbages and maples and oaks would not exist.

One such defense process involves the conductive systems of plants. Unlike humans, who have a single blood stream with a heart to provide circulation, plants have two separate systems. One flows upward carrying water and soil nutrients from the roots to the leaves, while the other system carries foodstuffs downward from the leaves, where they are manufactured, to all other parts of the plant.

The water and nutrient systems are formed by long, living cells that are laid down end to end. These cells deposit special materials as ridges in the wall so that the wall membranes are reinforced. Then the contents of the cells dissolve, leaving long, open tubes with reinforced side walls and occasional reinforced end walls that now form screen-like grids across the tubes.

Sun Energy

The energy for carrying the water upward in the plant is provided by the sun. As the sunlight strikes leaves, it causes evaporation of water from them. This evaporation sets up a suction that is transmitted throughout the minute water columns to the smallest rootlet and causes the upward flow of water through the system.

Injuries and infections of the water conducting systems are an everyday occurrence in the life of a plant. With such an open system, the danger is that infectious organisms will get in and be carried quickly up the superhighways that the water vessels provide. Germs do get in, but fortunately those sections of the superhighway that are infected are usually sealed off quickly. Since there is normally a much larger transport network than is needed, and since new lines are being laid down all during the growth period, the continued sealing off does not ordinarily harm the plant.

Defense Process

This defense process—how it works and what happens when it fails—has been identified and studied by researchers of the Rhode Island Agricultural Experiment Station with financial support from the U.S. Departments of Agriculture, and Health, Education and Welfare. The battle between an infecting organism and a plant, we find, is a race between the invading forces and the defensive forces, with all sorts of weaponry involved.

Let us assume that a grub has chewed a hole in a root of a tomato plant. Since there are thousands of single-celled spores (seed) of microorganisms in the soil-water, some of these are quickly sucked into the wound and up into the tube system. These spores are the mobile units for many parasites and they literally race up the tube network until they reach the first of the many gridded cross-walls. Here further progress stops until the spore can send out a growth strand to penetrate the cross-wall and produce

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From *Rhode Island Resources,* Winter, 1973 another mobile spore on the upper side of the membrane. The new spore then is in a position to race off to the next grid. This process takes about two days.

In the meantime, however, the first in a series of three defensive weapons is brought into play by the plant. First, the membranes of the side walls and the grid itself are caused to swell until the tubule is filled with a jelly-like substance much like apple jelly. The new-formed spores of the parasite are made immobile in this jelly. The parasite begins to produce enzymes that chemically chew up the jelly, but by now a second defensive process is well underway. This process involves a rapid growth of living cells that surround the tubules. Sac-like growths push into the infected vessel from all sides until it is completely walled off. Finally, chemical substances, called phenols, are released from specialized cells that store them, apparently for just such an emergency. The phenols serve to tan the whole new structure, much as shoes are tanned, so that it is highly resistant to chemical and physical wear and tear. This is how the defensive forces of the plant win the fight, as they do most of the time, day in and day out.

There are certain instances, however, in which the plant loses the battle. When a susceptible plant is invaded by a virulent parasite under suitable temperature conditions, the well-integrated defense system becomes disrupted. The gel forms, but it doesn't persist for more than a day. The sac-like outgrowths begin to form, but then their development is delayed for several days. In the meantime, the spores of the parasite leapfrog from cross-grid to cross-grid until the advancing wave of the parasite has outrun all of the active defense systems of the plant.

Eventually, the defensive forces do get the tubules sealed off, but only after the invading forces have advanced throughout the whole water-conducting system. When the defense finally comes into play, it seals off the whole water-conducting system. The water-conducting tissues then cannot carry sufficient water to meet the plant's needs. If the resulting water shortage is only moderate, involving only a portion of the conductive tissue, the plant's growth will be stunted and some branches may die. But if the shortage is severe, the plant will wilt and die. This is how American elms die when they become infected with the Dutch elm disease.

The fortunate fact, however, is that the defense system of most plants work effectively most of the time, or forests, farms and front lawns would not exist. Where they do not work, plant scientists are busily breeding stronger resistance processes into those plants that are important to us. This is being done with elms, potatoes, cotton and bananas, and many other crops all around the world.

Air Pollution-Resistant Red Maples

Adapted, with permission, from *News & Views*, AHS, Jan., 1976.

Discovery of wide variation in genetic traits of red maple trees (*Acer rubrum*) stirs hopes for breeding improved trees that are able to withstand inhospitable urban environments. These trees are already noted for their adaptability to urban sites, but plant geneticist Alden M. Townsend, Agricultural Research Service Shade Tree and Ornamental Plants Laboratory, Delaware, Ohio, believes even better cultivars can be developed. His research with red maples has been devoted to their adaptability to climate and air pollution and resistance to a disease called verticillium wilt. Traits Dr. Townsend also considers important are tolerance to drought, soil compaction and insects, as well as appropriate size, growth rate and good form. He hopes to develop hybrids with the desirable characteristics of superior parents, while removing undesirable traits.

ANOTHER LOOK AT WHY TREES DIE

Craig R. Hibben

We usually think of tree dieback and mortality in terms of simple cause and effect reactions. Infection by a blight fungus has caused the American chestnut to become all but extinct. The Dutch elm disease fungus continues to kill American elms. Salt applied to roads during the winter causes dieback in sugar maples. The air pollutant ozone, a component of smog, causes stunting and mortality of pine trees. An insect, the spruce budworm, defoliates and kills vast acreages of spruce, fir and other conifers. There are many similar examples.

The cause of disease or injury is not always so clearly identified as a single agent, like a fungus or an insect. We need to be reminded that trees also die because of the combined effects of several unfavorable factors in their environment. That is, biological (fungi, insects, man, etc.) and non-biological (drought, winter injury, air pollution, etc.) incitants can interact so that the combined stresses overcome the natural resistance mechanisms of the tree. This concept can be illustrated by describing a sequence of events which leads to the decline and death of a tree located, let us say, in a suburban backyard.

Event Number 1. Early in its life, the tree becomes infected with a virus transmitted to it by aphids feeding on the young leaves. There are few visible symptoms, but the tree will remain infected for life because most viruses become intimately a part of the living cells of their host. Although appearing healthy, the tree will now be slightly weakened and less able to resist future stresses.

Event Number 2. A period of abnormally warm days early one spring is followed by a sudden drop in temperature to well below freezing. Several frost cracks, the longitudinal separation of bark and wood, appear on the sun-exposed southwest portion of the trunk. During the next two years the cracks become calloused and heal, but not before fungi enter some of the wounds and begin the process of wood decay.

Despite the virus infection, healed frost cracks, and early wood decay, conditions are otherwise favorable for growth for the next several years. The tree shows no outward appearance of decline.

Event Number 3. This event accelerates the decline process. For two successive years, a region-wide infestation by the caterpillar of the gypsy moth results in almost complete defoliation during May and June. The tree soon forces a new crop of leaves after each defoliation, but, partly because of the previous two events, those forced the second time are smaller than normal and pale green to yellow in hue.

A chemical analysis of the tree roots reveals significant changes in the starch, sugar and amino acid contents. Roots in this condition now become more favored food sources for, and are invaded by, the soil inhabiting fungus, *Armillaria mellea*. This fungus rots tree roots, but it can only become established on the roots of unhealthy trees where there have been unfavorable metabolic changes reflected in the compounds stored in the roots.

During the next few years the tree exhibits the first symptoms of decline, brought on by the combined effects of advancing sapwood decay in the trunk and the rotting of several main roots. The symptoms consist of a reduced radial width of the annual growth rings in the sapwood, shortened length of shoots, and scattered twig dieback in the outer portion of the crown.

Event Number 4. While excavating a ditch for a sewer line the homeowner severs a few main roots of the tree. This further reduces its water and nutrient absorbing capacity. Dieback progresses further down the branches.

Two events now occur which act directly on the leaves of the tree.

Event Number 5. The suburban site is downwind of a major city. Ozone, the air pollutant which is largely produced by the action of sunlight on automobile exhaust gases, reaches levels that become injurious to vegetation, especially during periods of air stagnation over the city. The ozone injury appears as tiny tan or reddish brown flecks on the upper surface of the leaves. The accumulative effect of this injury is to reduce photosynthesis, thereby decreasing the food producing capability of the tree.

Event Number 6. A particularly wet spring during the period of leaf emergence encourages infection by several leaf-spotting fungi, which cause a scorching of the leaves and some premature defoliation.

The decrease in food reserves resulting from events 5 and 6 lowers tree vigor and makes it less able to overcome the effects of earlier events. It is now clear that each event although not lethal by itself predisposes or weakens the tree so that following stresses become more harmful. As the tree becomes less able to resist the accumulative effects of several stresses, decline in the form of branch dieback gradually progresses.

Event Number 7. With branch dieback progressing each year and decay advancing in trunk and roots the tree is unable to withstand the final unfavorable event. A drought occurs which consists of three consecutive summer seasons with below-average rainfall. A moisture stress quickly develops in the tree because of its reduced root system. When the moisture of the bark drops, several opportunistic fungi invade the trunk and branches and produce cankers. These are sunken, localized dead patches in the bark and they have the effect of girdling and causing the death of distal portions. These canker fungi are unable to infect healthy trees.

The dieback process is accelerated until in a few more years most of the main branches are no longer functional. In one last attempt to survive, the tree develops sprouts along the trunk but it is soon dead and has to be removed because of the safety hazard of falling branches.

The point has been made that several agents such as virus, fungus, insect, air pollutants, low temperature, drought and man in this example can interact to cause the decline and death of trees. Incredibly poor site conditions for street trees in most cities is another causal factor of poor tree health. A better understanding of how the many stresses in the environment affect trees will help us to both diagnose tree problems more accurately and to recommend successful control measures. ⁂

M. Joyner

A dying maple on a busy city street. Is the cause pollution, drought, disease, insects, severed roots from sewer construction, highway salt or all of them?

Rx FOR WOUNDED TREES

Follow this prescription for preventing or minimizing the damage caused by decay.

Prepare:
Learn about trees. (The booklets in the U.S.D.A. Forest Service series are designed to help prepare you to care for your trees properly.)

Plan:
Plant trees according to a carefully thought-out plan. Do not plant trees in the paths of either present or potential wounding agents. Do not plant trees close to driveways, walkways, streets, patios, or houses.

Protect:
Protect trees from wounding. Give your trees proper protection, especially during construction jobs.

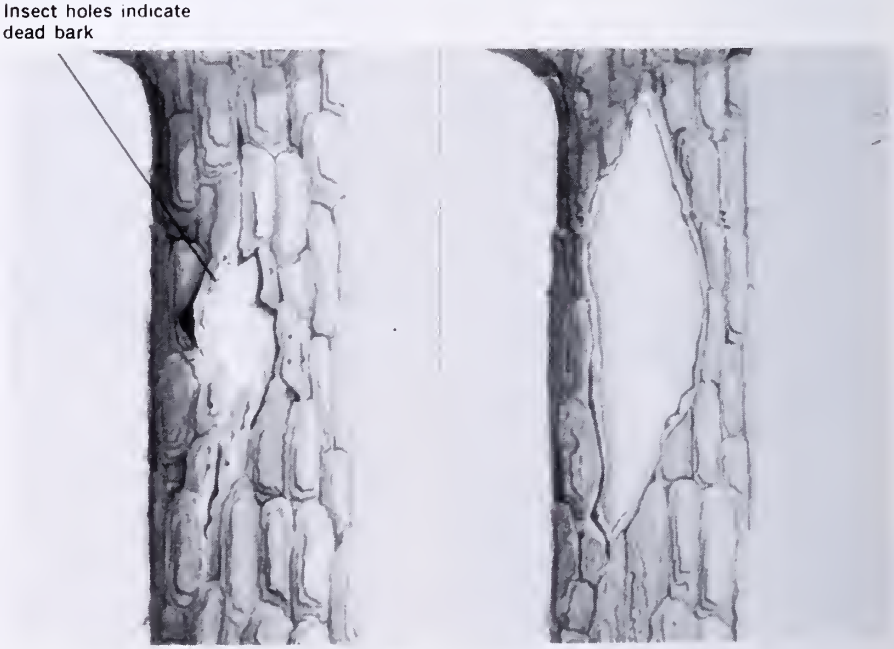
Prevent:
Prevent the development of decay following wounding. Treat wounds properly to help trees heal themselves faster. Establish a regular checkup program to keep healthy trees in good condition and to improve the health of sick or wounded trees.

Prune:
Prune trees as necessary. Prune dead and dying branches. Also remove suppressed sprouts, hazardous trees, and low value trees that may crowd the valuable injured tree.

Provide:
Provide fertilizer, water, and constant care. All are important elements in maintaining trees and/or increasing tree vigor.

Professionals:
Seek help. A qualified professional tree expert should be consulted about major tree jobs.

And, remember, SAFETY FIRST! Know your limits with tools and the job that must be done. Working with and around trees can be dangerous!



Remove bark covering old wounds. Insects and microorganisms grow rapidly under old, dead bark. Old wounds that have formed a callused ridge should not be scribed (right).

HOW TO TREAT WOUNDS

Try to prevent wounds first, but when a tree is wounded, take these steps:

1. Remove dead and injured bark from around the wound with a sharp knife. Scribe wound in the shape of a vertical ellipse, if possible. Cut bark away from wound to form an interface of healthy wood and bark, although this may enlarge the size of the wound.

2. Prune dead and dying branches to increase tree vigor.

3. Remove dead and fallen branches and trunks from the ground nearby. Such dead wood may harbor wood-inhabiting microorganisms that could infect wounds.

4. Thin out and remove less valuable trees nearby to reduce competition for nourishment in favor of the wounded tree.

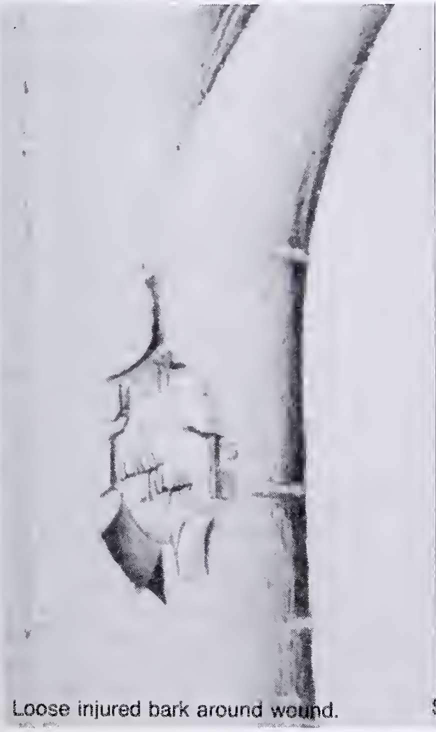
5. Fertilize and water the tree properly to increase vigor.

6. Discuss the wounded tree with professionals. Establish a maintenance program.

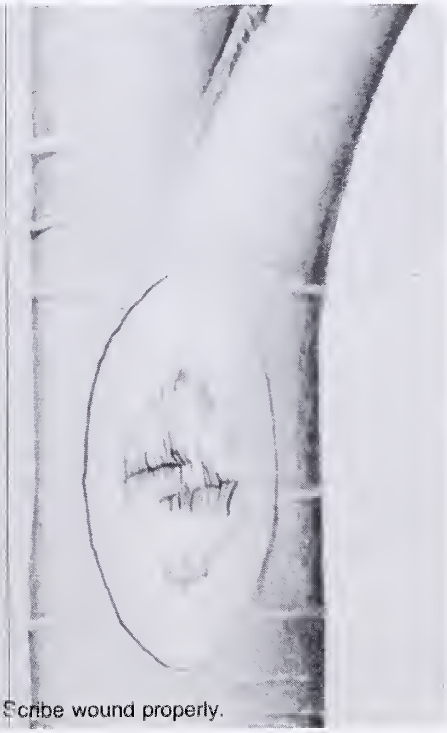
7. Apply some wound dressing, if desired.

Reprinted from *Rx for Wounded Trees*, U.S.D.A. Forest Service Bulletin AIB-387. This and other valuable booklets available from Supt. of Documents, U.S. Gov't. Printing Office, Wash., D.C. 20402.

Pictures: *U.S. Forest Service*



Loose injured bark around wound.



Scribe wound properly.

A PERSPECTIVE ON PESTICIDES

J. T. Walker

Pesticides and their specific role in the world's environment have changed little in the last decade, while the need for crop protectants and animal health products has increased in response to the pressures for greater production of higher quality food and fiber. What has changed is man's attitude; the emphasis shifting to a greater attention to the impact of pesticides and other chemicals on the environment.

Only a few years ago answers to questions of persistence, metabolic pathways in animal tissue, accumulation in soil and water and effect on target and non-target organisms were known only to a few academicians. The development of sophisticated instruments and techniques that provide exceedingly infinitessimal quantitative answers to long-sought questions have appeared on the scene, answers necessary for all pesticides before being registered for use.

Concern Spurs Research

The public interest in the environment and pesticides has seen a revitalization of the science of ecology. Biologists, many of whom have long been concerned with the environment and its problems but were limited by lack of support and enthusiasm for their programs, now suddenly find their work receiving greater attention, particularly so in the area of biological pest control or integrated pest management. For example, researchers studying the various viruses of lepidopterous insects (butterflies and moths) and certain pathogenic fungi hope that practical economic controls eventually may evolve.

The new discoveries of insect pheromones (chemicals secreted by insects that affect sexual behavior of the same species) has shed considerable light on insect biology and increased the possibility for controlling pest populations by this means. The gypsy moth sex attractant (disparlure) is but one recent example. The development of systemic fungicides (acting within the host plant) may eventually give full-season control of wheat rusts, according to the USDA.

Encapsulation of crop protectants, as is being done with certain slow-release fertilizers, may provide greater possibilities for controlled release of specific chemicals such as herbicides, thereby preventing excessive runoff into our rivers and streams.

Multilevel Concern

The U.S. Congress passed, and the President signed into law the Federal Environmental Pesticide Control Act of 1972, which defines the registration, labeling and use of pesticides as well as the licensing of specialists for commercial pesticide application, FIFRA. Many states have enacted similar laws complimentary to this federal legislation. These laws, of course, are only part of the total environmental legislative package which has been or may be needed (1972 Water Pollution Control, the Clean Air Act amendments, the Noise Pollution Bill). The creation of federal and state environmental agencies, the establishment of pest management college curricula, and an expanded attention by industry to the environmental problems certainly reflect a more realistic attitude about solving our problems.

The public must continue to recognize the problems and support the education, research and laws necessary to bring about sound solutions for the least cost. A broader understanding of the effects on the environment of materials necessary for plant and animal health will lead to more judicious decisions concerning their use of application. This will be but one phase of the challenge to agriculture to meet the needs of man without sacrificing the environment.

Sell the farm or cultivate it?

THE DILEMMA OF THE NORTHEAST URBAN FARMER

Robert Josephy

(A Connecticut farmer only sixty miles from New York City who specializes in less common types of apples, Mr. Josephy has faced and coped with the very dilemma he speaks of in this article. He points out that farms are a precious resource, not just for food production but for open space and for the opportunity to observe a way of life that is becoming increasingly exotic to city and suburban people. The disappearance of farms close to cities, a phenomenon of the mid-twentieth century, has not been caused by the population increase alone; many other factors, largely unrecognized by non-farmers, have contributed to the decline of these farms. The importance to all of us of the ones that remain is the subject of this article.)

Between 1940 and 1972 there was a period of steadily declining fertilizer prices and of ample cheap supplies of energy. Food production increased by about 70% on essentially the same number of acres. In these years mechanical power and machinery inputs increased by 237%, fertilizer use by nearly 900% and land under irrigation from 18 million acres to over 40 million. At the same time, farm labor inputs fell by two-thirds. The total acreage farmed in the nation as a whole has remained quite stable; land newly cleared or irrigated has largely replaced land taken out of production and used for suburban development, highways and defense areas.

America's growing population and rising exports have wiped out the food surpluses once thought permanent. Between 1961 and 1972 we held out of production from 37 to 65 million acres of cropland to reduce downward pressures on the commodity markets. This land is now once again in production. At the same time, the spectacular increase in the per-acre production of most crops since World War II is now leveling off. We are finding that gains in farm machine efficiency, in techniques of crop protection, in plant and animal breeding and nutrition, are not unlimited. The use of non-renewable energy for farm power and for manufacturing fertilizer, chemicals, machinery and other farm inputs has become prohibitively expensive. Added to all this, food production in many states has been cut back by the conversion of farmland to other uses such as highways (26 million) and military installations (25½ million).

Crops in the Northeast—Do They Pay?

The nine northeastern states encompass only 4.6% of the land area of the United States but they house 24% of the people. They have a little over 25 million acres in farms, 2½% of the national total. In spite of their limited acreage, these nine states produce surprising percentages of the national food supply: about 19% of the dairy products, 16% of the eggs, 16% of the potatoes, 25% of the apples. As is to be expected, the production of grains is minimal, as is livestock feed, with the exception of a 14% figure for silage corn.

How profitable is farming in the Northeast? The conventional wisdom is expressed in the old joke about the two farmers who were asked what they would do if they suddenly inherited a million dollars. The first one said he'd sell his farm, buy a house in Florida and go fishing every day. The second man thought for a while and said, "I guess I'd just keep on farming 'til the money's all gone."

The truth is, however, that the income per acre of Northeast farmers is nearly twice the national average. Surrounded by consumers, they sell a substantial part of the food they grow at retail farm markets, and most of the rest to nearby dis-

Eleanor A. Schrawder

In the distance houses are springing up, encroaching on farmlands.

tributors and processors. Because of high land and production costs and small acreages, they tend toward the intensive production of high value crops such as fresh fruit and vegetables.

Why Do Farmers Go Out of Business?

Because of irregular, in too many cases entirely unplanned, patterns of urban development, the price of farmland ranges from agricultural value (the investment in land that a farm enterprise can carry) to ten or fifteen or even twenty times what the land is worth for farming. Thus the chief cause of the conversion of farmland to other uses is that farms can often be sold at very high prices for residential, industrial or commercial development. If most of our families had not acquired their land many years ago, they could not afford to farm today.

Family tradition and emotional ties to farming as a way of life are strong. Sooner or later, however, the farmer may feel the loss of rural tranquility, a diminished rapport with his neighbors, discontent with the changing environment, or the frustrations of multiplying paperwork. For the new farmers, those whose families don't own farms, there are places for some on existing farms. However, if they want their own enterprise, there is little, if any, good land to be had at realistic prices. How to make it economically possible for a new generation of farmers to take over our farms is one of our toughest problems and one without a ready solution in our present economy.

The Costs of Urbanization

A recent report of The Citizens Advisory Committee on Environmental Quality says, "A significant amount of agricultural land is a prime target for urbanization. It is estimated that about 17.2% of all U.S. farms are within the Standard

Metropolitan Statistical Areas (counties with cities of 50,000 or more), putting them directly in the path of urban expansion. These units produce about one fifth of the Nation's food." The cost of losing farmland in these areas includes many factors beyond the reduction in national food totals. There is a diminished supply of vegetables and fruits which require special soils and climate, and, because they are highly perishable, need to be grown near the people who consume them. There is increased pressure to replace lost farms with marginal land that is highly vulnerable to erosion, poor in drainage, or has other serious limitations. The scattering of remaining farms often leaves an insufficient economic base for essential farm supply services, and a shortage of experienced labor.

Are Farmers Pollutors or Conservers?

At all levels of government and in the private sector huge sums are being spent to protect and improve the environment. Farmers who are the custodians of a great part of all privately owned lands have long been active in soil and water conservation and improved land use. Possibly because their land is scarce and valuable, Northeast farmers have cooperated in much more than their quota of conservation programs. Unfortunately, there is often a conflict between land preservation as interpreted by the conservationist and the farmer's need to farm without costly impediments.

On my own farm, for instance, we have since the 1940's buried a mile or two of stone walls, cleared and graded several pieces of rocky swamp and pasture, dug three farm ponds, and installed extensive drainage structures. Today these efforts to improve productivity and efficiency might be viewed by some as desecration of the environment. There is a real conflict between those who love other people's stone walls and those who have to work small fields and cut brush; between those who cherish every bit of swamp and woods and the farmer's sense of order and the thrifty use of his land.

As farms become fewer, their value to their neighbors grows. They provide open space—space the town does not have to buy and which the requirements of efficient management keep reasonably neat and beautiful—unlike open-space which must be maintained or will revert to brush and scrub woods. They supply some cultural experiences for urban children, and a reminder for adults of their ancestral roots.

What is "Economic" Now?

In the Northeast the general admiration for big-agriculture mechanization persuaded some of us to abandon too quickly the productive farms that were judged no longer economic when labor was scarce. Now we seem to be passing the break-even point on mechanization. Put simply, we seem to have more labor than we have steel and oil. If that is so, we are in a good position to react; our farms are smaller and many of the crops that are grown will respond to labor-intensive methods of production. By raising output we can reduce our dependence on food from the West and the South. We have a market here for all the fruits and vegetables we can grow, and land enough for some new crops such as soybeans for our livestock.

We have many advantages, but we need some help. There must be more research on the crops and technology of small farms. (The United States Department of Agriculture has concentrated its research on the problems of mass-production.) There must be better ways of getting Northeast farm products into Northeast urban kitchens. Retail markets on the farms are one way. The chain-store distribution system, designed chiefly for indestructible packaged goods, is wasteful and inefficient in the handling of fresh farm produce, but it can be changed if consumers demand it.

What Kind of Society?

Can we afford a society in which a large part of the people have no kind of rural connection? Here in the Northeast the alternation of town and country still offers opportunities for many kinds of experience. If we lose our farms, if the Northeast is finally all paved over, we will lose much more than food. ❧

FURTHER READING

Many environmental books have been published in recent years—enough titles to fill an entire BBG issue. The following is necessarily a very brief list of ones that have a longer-term place on the library shelf and should serve as a gardener's introduction to this wide-ranging subject.

American Wildlife and Plants: A Guide to Wildlife Food Habits by Alexander C. Martin, Herbert S. Zim and Arnold L. Nelson, Dover Books, New York, 1951

Beyond Your Doorstep: A Handbook to the Country by Hal Borland, Alfred A. Knopf, New York, 1962

Biological Control by Natural Enemies by Paul DeBach, Cambridge University Press, New York, 1974

The Closing Circle by Barry Commoner, Alfred A. Knopf, New York, 1971

Conservation Directory by National Wildlife Federation (1214 16th St., N.W., Washington, D.C.), 1976

Design with Nature by Ian L. McHarg, Natural History Press, New York, 1969

Encounters with the Archdruid by John McPhee, Farrar, Straus and Giroux, 1971

Gardening with Wildlife by National Wildlife Federation (1214 16th St., N.W., Washington, D.C. 20036), 1974

The Growing Tree by B. F. Wilson, University of Massachusetts Press, Amherst, 1970

Handbook of Wild Flower Cultivation by K. W. Taylor and S. F. Hamblin, Macmillan Co., 1963

How to Grow Wildflowers and Wild Trees and Shrubs in Your Garden by Hal Bruce, Alfred A. Knopf, New York, 1976

Living With Your Land by John Vosburgh, Charles Scribner's Sons, New York, 1972

The Nature of Landscape Design by Nan Fairbrother, Alfred A. Knopf, New York, 1974

Our Plundered Planet by Fairfield Osborn, Little, Brown & Co., Boston, 1948

Plant and Planet by Anthony Huxley, Viking Press, New York, 1974

The Population Bomb by Paul Ehrlich, Ballantine Books, New York, 1971

Prairie Propagation Handbook by Harold W. Rock, Boerner Botanical Garden (Hales Corners, Wisconsin 53130), 1971

Reading the Landscape by May Watts, Macmillan & Co., New York, 1957

A Sand County Almanac by Aldo Leopold, Ballantine Books, New York, 1970

Silent Spring by Rachel Carson, Houghton Mifflin, Boston and New York, 1962

So Human an Animal by René Dubos, Charles Scribner's Sons, New York, 1968

The Study of Plant Communities: An Introduction to Plant Ecology by Henry J. Oosting, W. H. Freeman & Co., San Francisco, 1958

The Web of Life—A First Book of Ecology by John H. Storer, New American Library, New York, 1972.

The Wild Gardener in the Wild Landscape by Warren G. Kenfield, Hafner-Macmillan, New York, 1972

Woodland Ecology by Leon Minckler, Syracuse University Press, Syracuse, 1975 ✣

Owning a stand of trees can be challenging and entertaining, so why not . . .

ENJOY YOUR WOODLOT

E. C. Childs

As a youngster I was fortunate in being able to spend several months each year on my grandparents' farm on Long Island, N.Y. Gardens, pastures and fields stretched across the uplands which broke away sharply to the north in a confusion of gravel hills and small valleys. Springs at the extreme north end fed a stream that meandered off towards Long Island Sound. The steeper portion of the lands, comprising some fifty acres, had been in woodlot and forest growth for many years. By 1912 the chestnut blight had left its mark and countless dead and dying trees reached up among the oaks, hickories and tulip trees that formed the major composition of the forest. All was not lost, however, for a sawmill was set up and, with lumber obtained from the doomed chestnut, a bungalow was built where my family and I spent many wonderful days in the years ahead.

Numerous varieties of azaleas and rhododendrons were planted in the woods, particularly in those areas where dense stands of chestnut had been removed. With ample light the shrubs thrived on the gravelly, acid soils. Flowering apples and cherries were introduced. These, together with drifts of flowering and Japanese dogwoods and redbud produced an incredibly lovely wild garden. Again in late September and October the woods were brilliant with autumn foliage. What was significant about this particular development was that the right introductions were selected for the right environment. Once established the amount of upkeep was minimal, consisting mostly of keeping the roads in repair after winter and storm damage, and brushing out the woodland paths occasionally.

As time went on the sawmill was only used sporadically. However, quantities of excellent cordwood were cut each year to supply both furnaces and fireplaces. Trees selected for removal were those that were damaged by storm or disease, those that were poorly formed or those overtopped or crowding more desirable trees. There was, of course, no attempt to make the woodlot pay for itself in terms of dollar return but as years passed the satisfaction of something new, surprising and beautiful amply repaid the effort. (Quite recently this wooded area was turned over to an established bird sanctuary. It may be visited at any time and in its new role hopefully will continue to give joy and inspiration to many.)

Forests Are Just Holding Their Own

For the time being the forests of the United States are keeping pace with the demands upon them for lumber, pulp, plywood and innumerable other products. This may not always be the case, however, with our population expanding and with increased competition for the land upon which our forests are growing. Not only in this country but throughout the world, new highways, lines of communication, industrial expansion, airports, shopping plazas and building sites take their toll on the forest. It is a depressing fact and one which may have disastrous consequences if not corrected in the future.

About two-thirds of our commercial forest land is owned by some four million individuals with holdings ranging in size from several thousand acres on down. The average holding is fifty acres. While farmers still form the largest group of woodlot owners, it would be almost impossible to generalize on the occupation of the rest. Unfortunately, few owners know much about the management of a forest area, and they tend to simply leave it alone.

Ownership Implies Management

Management, of course, means planning ahead, the plan depending on what you

Gottscho-Schleisner

The solemn splendor of snow in the forest—one pleasure of owning a woodlot.

hope to accomplish. Income from a small woodlot would be limited and sporadic at best. The owner might be well-advised to accept the forest cover he has. (This would vary widely and move from the mixed coniferous-hardwood forests of the East to the predominant hardwoods of the middle valleys to the conifers of the West.) Fuel wood could be available in adequate amounts each year from thinnings and additional cuttings could be made when conditions warranted and prices were good. These cuts could be selected individuals or on a group selection basis. The forest can be kept in the very best condition for wildlife and in balance with the growth and aging of the stand. Planned cutting would also periodically let in sunlight for plant development and maintain the attractive character of the forest for many recreational pursuits. A group selection cut would provide the needed openings in the forest canopy necessary for the growth and development of important intolerant species, such as black cherry, tulip, oak and pine in the East, and Douglas-fir and pine in the West. There are also certain incentive payments for the planting, thinning, pruning and certain other measures under the National Agricultural Conservation Program. (Your county agent

Darrell Russ

Farms and woodlots intermingle in northwestern Connecticut, the least developed area of the state.

should be consulted.) States also offer tree planting stock at somewhat-to-considerably reduced prices. The message is clear: the State, the Federal Government and all of us want and need the many owners of woodlands to do a good job; and the chances are that the more they do, the better we will all like it.

Perhaps the best advice to the small woodland owner would be to do what he is probably already doing and enjoying. That is, to get out into the woods and to take a closer look at his woodland. Get to know the woodland intimately. Learn the various tree species in season and out, their interrelationship, where they grow and why. Forests are constantly changing and growing up and older. If there are 1,000 trees on an acre today there will not be a 1,000 trees twenty years hence. In fact, the number may be closer to 300. However, with all things being equal there will be at least twice the volume on the 300 remaining trees. The forester's role is obviously one of selection. So get to know your forest so that you can select intelligently. Get to know also where the deer cross the stream, where the partridge roosts, or where the family of flying squirrels sleep away the daylight hours. Enjoy your first Christmas tree cut from your own woods' edge.

Interested in learning how to manage a small woodlot? Which trees to keep and which to cut for firewood? Thinking of a possible eventual harvest? There are many technical books on forestry, but a good introduction for the homeowner with some spare land is *Woodland Ecology* by Leon Minckler (Syracuse University Press, $9.95). ☘

Wildlife plants . . .

FOR BEAUTY AND THE BIRDS

Frederick McGourty, Jr.

Food plants for the birds? Why not—as long as catalog-proclaimed miracles aren't expected from "berry" shrubs. The backyard naturalist will still have to rely on sunflower seed at the feeder to have a steady return of cardinals, chickadees and nuthatches, but there is the pleasure of knowing that many of our favorite garden shrubs and trees are equally esteemed by avian visitors. It takes more planning when choosing landscape plants for the dual purpose of providing gardener and wildlife satisfaction, but the rewards are numerous, even if the long-lasting (hence potentially valuable) fruits of some species are spurned in late winter some years.

Birds vary in their feeding upon garden bounty from year to year depending on a variety of factors. For example, pines and spruces could have had excellent cone crops in the North Woods, so the evening grosbeaks might not appear at all in the garden: or maybe the aronias (chokeberries) will drop their fruits after the first hard frost of autumn, although the gardening and wildlife books report that they are long lasting; or the scarlet berries of pyracantha are devoured one year, left another for some inexplicable reason.

The habits of both the birds and of fruiting shrubs are sometimes unpredictable to us humans, who like to set a neat pattern to things. Birds don't have the nicely dependable feeding habits of the family dog. We are dealing with living, wild things and must accept them more-or-less on their terms.

It hasn't often been said, but many of the plants recommended for wildlife plantings are scruffy horticultural subjects: blackberries and other brambles, mulberries, elders, certain barberries and multiflora rose (now banned in Ohio because of its weediness). Beyond the gardener's pale are such useful wildlife foods as ragweed, poke (though occasionally grown in England as an ornamental) and poison-ivy (once purveyed overseas by a few American nurseries, including the old Bartram firm). Some of these are perhaps quite good plants if the acreage is substantial and the gardener can afford to let things ramble and clamber. Most of us can't, so a compromise is in order—to let the aesthetic needs of man combine with the foraging requirements of birds.

A very tidy garden usually doesn't attract many birds, but there are few people left who in any case want the formality of Hampton Court or the carefully clipped symmetry of Versailles. One solution is to set up a "demilitarized" zone of fruiting and cover shrubs between lawn and tall-growing trees or woods. It is here that most wildlife can be found. Environmentalists refer to this as the convergence of ecosystems (where there is an explosion of sorts), but for our purposes, it's simply the hedgerow where life abounds.

Perennials

In front of an informal hedgerow or two, which might consist of closely planted viburnums, highbush blueberries, honeysuckles and similar shrubs in variety and number, a medium-sized perennial border is an added attraction to birds if the plants are selected with care. Columbine, butterfly-weed, summer phlox, various sages and bee-balm have flowers that appeal to hummingbirds. If allowed to go to seed, purple coneflower (*Echinacea*), perennial rudbeckias and sunflowers, and garden varieties of mullein, aster and goldenrod are apt to bring goldfinches, sparrows and other small songbirds. In addition, an inconspicuous bird bath or two can be a great help since birds are often drawn to a garden by water even more than by plants.

After the initial preparation and planting of such a "bird" border, the dimensions of which might be, say, 30 feet by 4 feet, the ground should be mulched with a

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Adapted with permission from THE AVANT GARDENER, Vol. 8, No. 21.

Brenda Weisman

By planning for a steady food supply, one can have the secondary pleasure of seeing the nesting and rearing of young.

couple of inches of old tree leaves, buckwheat hulls or other coarse organic material to conserve soil moisture and discourage weeds. Less than ten hours of maintenance, regularly given, is needed in summer to keep a border of this kind in fairly presentable condition. The main work is in spring. This consists of occasional division of plants, especially beebalm, to keep them thrifty, and the roguing of unwanted seedlings so the border doesn't become a tangle by mid-summer. One labor-saving technique is to keep the border narrow so it can be weeded from two sides.

A "Tier" Garden

The aesthetic backbone provided by such an arrangement (tall trees or woods in the rear, informal hedgerow in the center, fairly low herbaceous border in front) is a good start toward garden design for most of us because three viewing levels or tiers (four if lawn is included) are accounted for. Boring landscapes are usually those in which the eye is drawn repeatedly to a single level, whether in a new garden, an endless prairie or an alder swamp. By good fortune the multi-tier scene attracts the most songbirds too, because it affords variety in cover, nesting and foraging.

If you are lucky enough to have a few large trees, let them be, although it may be necessary to trim up lower branches to let light in for shrubs to flower (and hence fruit) well beneath. If there happens to be a dead tree far enough from the house so it poses no danger, or even a large limb that has passed on, don't be too quick to call the local arborist, though he will be happy to explain the benefits of tidiness and charge you a fee. If the tree strikes your eye as unsightly, plant Virginia-creeper or Boston-ivy at the base because they are fine wildlife vines. Woodpeckers and perhaps owls, flying squirrels and other forms of wildlife will find the tree.

No large trees? Then plant for the future. Pines, spruces and oaks, especially white oaks though they are slow growing, are good plants eventually for the birds. Set them closer than they would be in typical lawn situations for they will grow taller and provide nesting and perching sites more quickly. Give prominence to the conifers because they provide winter

J. Horace McFarland

Washington thorn (*Crataegus phaenopyrum*) flowers and fruits abundantly.

cover and ultimately cones, which contain seeds that many birds feed upon.

Small Trees

Let's look at small trees for a moment. Flowering dogwood (*Cornus florida*) is choice for many reasons, particularly for its fruits which are available from autumn until early winter. For a change try Cornelian-cherry dogwood (*C. mas*), too. Its early-spring yellow flowers are modestly pleasing, and the red fruits ripen in mid-summer. According to legend, the wood for the Trojan horse came from this species.

The various amelanchiers, known under such names as service-tree, shadbush and Juneberry, are also good. They can be either trees or shrubs—*Amelanchier laevis, arborea* (*canadensis* in part), *stolonifera,* etc. They are splendid plants because of their white flowers in early spring, reddish-black fruits which ripen in June, often brilliant autumn color and smooth gray bark. The berries are edible by humans, too. Amelanchiers lend themselves to formal or informal plantings and can tolerate a little shade. They are one of America's most overlooked plant groups.

The country's many hawthorn species are good wildlife plants. Practically all of them are small trees with red fruits that are eaten by birds at one time or another. The most commonly planted in cities is Washington thorn (*Crataegus phaenopyrum*). Its fruits are normally long lasting, an important quality for wildlife. Avoid 'Paul's Scarlet', a variety of the English hawthorn (*C. laevigata,* formerly *C. oxyacantha*), and other double-flowered sorts grown exclusively for bloom. *C. nitida,* with fruits often lasting to January, is great if a nursery source can be found.

Mountain-ashes, mainly the European *Sorbus aucuparia* and the New World's *S. americana,* are sometimes included in naturalistic plantings because of their orange-to-red fruits which ripen in late summer. The bounty is quickly devoured by robins, catbirds and waxwings, but these trees can be notoriously short-lived if borers or sawflies are abundant and the gardener is reluctant to use insecticides.

It should be said that certain members of the large Rose Family, of which the mountain-ashes and cherries are, seem more susceptible to insects and diseases than many other kinds of plants. This doesn't justify the removal of native cherries and other representatives of the *Prunus* genus from a low-maintenance wildlife area, but it may mitigate against planting a large number of new ones. As it is, black cherry (*P. serotina*), pin cherry (*P. pensylvanica*) and chokecherry (*P. virginiana*) are prolific seeders and once established will always be around.

Evergreen Hollies

American holly (*Ilex opaca*) is usually a small pyramidal tree worth considering. It is the only broad-leaved evergreen tree native to the northeastern United States, and more than 1,000 cultivars have been named. 'Old Heavyberry' and 'Arden' are good fruiters. Leaf miner often disfigures the foliage of American holly. Where more attractive evergreen species can be grown, such as the glossy-leaved English holly (*I. aquifolium*)—in the mid-Atlantic states and Pacific Northwest, and Chinese holly (*I. cornuta*)—Deep South, West Coast, and even north to the Connecticut shore, they are desirable. Fruits of these hollies sometimes last a year.

Hollies are commonly dioecious, *i.e.,* fruits are borne only on pistillate (female) plants, but staminate (male) plants are needed for pollination. A point to note is that Chinese holly and some shrubs of the native deciduous *Ilex laevigata* occasionally form parthenocarpic fruit. That's a holly form of Women's Lib—pistillate plants may produce fruits without pollination. (Consideration to men: such fruits are sterile.) Unless the sexes of the hollies sold by a nurseryman are known, purchase at least several plants to save disappointment. Excess males can be rogued later when plants are old enough to flower.

The majority of American hollies are southern or midwestern. Northern visitors to Virginia's Colonial Williamsburg in spring are often surprised to see persistent red fruits on the evergreen yaupon (*I. vomitoria*), a tall shrub or small tree depending on circumstance and pruning. Somewhat further south the dahoon (*I. cassine*), a larger evergreen with long-lasting red fruits, is encountered in the wild. Neither can survive northern winters but are appropriate for wildlife plantings in mild-climate gardens. Superficially similar but with distinct shrubby growth and black fruits is the inkberry (*I. glabra*), one of the hardiest broad-leaved evergreens. There is a compact form, also one with dull white fruits.

Crab Apples and Junipers

Many dozens of crab apples (*Malus*) are on the market, and the showy double-flowered sorts seem to be favored by gardeners. For wildlife purposes select the single-flowered species or cultivars with small fruits, or semi-double sorts if conspicuous bloom is important. Among the best and longest-lasting fruiters at Brooklyn Botanic Garden are Sargent crab (*M. sargentii*), cutleaf crab (*M. toringoides*) and redbud crab (*M. zumi calocarpa*). The Sargent crab deserves special attention in smaller gardens because it is semi-shrubby. 'Red Jade', a weeping form that originated at BBG, has abundant and persistent bounty.

Herman Gantner

Supplementary food during the coldest months of winter keeps the birds near year 'round.

Herman Gantner

Doublefile viburnum (*V. plicatum tomentosum*) is a pleasing springtime sight and has generous autumn beauty.

Many crabs bear a heavy fruit crop one year, a relatively light one the next.

Most of the crabs in the trade, including the ones mentioned above, are either Oriental species or are derived from them. They are resistant to cedar-apple rust, a consideration in areas where red-cedar (*Juniperus virginiana*) and American species of crabs are native. Briefly, if your garden or wild area has native crabs, it would be best not to introduce red-cedar, but there need be no fear of cedar-apple rust if you have red-cedars and introduce Oriental crabs.

Red-cedar, a juniper that is a familiar sight in old fields of the eastern United States, is a good wildlife species, as is its oriental counterpart, *J. chinensis*, of which many columnar and spreading cultivars have been named. Plants are usually dioecious and the blue, berrylike fruits can be expected on pistillate forms if properly pollinated, though all junipers are satisfactory for our purposes because their dense evergreen foliage provides winter cover. Don't be impatient for the fruits; they may in some cases take two years to ripen.

Viburnums

If one had to select a single group of shrubs for bird appeal and flowers, it would be the viburnums. Not all are first-rate garden plants for neat growth habit, but most, except the snowball (sterile) forms, are dependable fruiters provided cross-pollination is good. A wise practice is to plant several seedlings or different clones of the same species for proper fruit set. The importance of this was made clear to the author one autumn when he saw an arboretum collection of thirty plants, representing thirty different species of viburnum, and hardly a fruit was present.

Linden viburnum (*V. dilatatum*), from eastern Asia, and American highbush-cranberry (*V. trilobum*) often hold their red fruits until midwinter. The latter is confused in the trade with a closely related European species, the guelder-rose (*V. opulus*), which is not a good shrub because plant lice disfigure foliage and twigs. (A diagnostic difference: petioles in *V. trilobum* have small, usually stalked glands at the apex; in *V. opulus*, glands are large and disc-like.) *V. sieboldii*, which eventually assumes the dimensions of a small tree, ripens its fruit in midsummer and is ornamental partly because of the persistent red fruitstalks. In recent years several red-fruited hybrid viburnums or species selections with Indian clone names have been released by the Department of Agriculture and are appearing in nurseries.

Slightly less ornamental to man but appealing to the birds are blue- or ultimately black-fruited viburnums, a number of which are native. They include arrowwood (*V. dentatum*), which gets leggy, and two tall-growing kinds, black-haw (*V.*

prunifolium) and nannyberry (*V. lentago*). Withe-rod (*V. cassinoides*), growing to only about 6 feet, is attractive because the fruits undergo several color stages before turning black. Below the Mason-Dixon Line smooth withe-rod (*V. nudum*) and southern black-haw (*V. rufidulum*) might be substituted. The exotic evergreen viburnums (*e.g.*, *V. odoratissimum*, *V. tinus*) are safely grown only in the South and on the West Coast, though one species, the leather-leaf (*V. rhytidophyllum*), is able to limp through northern winters. It looks like a stranger in a strange land.

A couple of deciduous viburnums from the Orient deserve a note for beauty even if their role in wildlife plantings may be slightly exceeded by species with longer-lasting fruit. One is the doublefile (*V. plicatum tomentosum*), especially variety 'Mariesii', whose flattened snow-white flower clusters on tiered branches make it one of the most ornamental of all shrubs. The red fruits, which are not as profuse as some, become black when ripe. The other shrub is the orange-fruited tea viburnum (*V. setigerum* 'Aurantiacum'), which is a heavy bearer though plants are sparsely branched.

Honeysuckles

This is another key group of wildlife shrubs. Honeysuckles (*Lonicera*) complement viburnums well in naturalistic plantings because fruits of many of the common kinds ripen and are consumed quickly in midsummer, whereas most viburnums are autumn-bearers. Our attention turns to birds mostly in winter, but they require food year-round and their appetites in the mild months, when the young are being nurtured, are gargantuan. Tatarian honeysuckle (*L. tatarica*), a large upright shrub with flowers that may be white, pink or red depending on variety, usually produces a good crop of red fruits in July. It's an old standby and nothing seems to attack it except the birds. The handsome yellow-fruited cultivar, 'Lutea', is as good for wildlife, too.

Morrow honeysuckle (*L. morrowii*) differs from *L. tatarica* in its moundlike growth and white flowers that turn yellow; the red fruits are equally valuable. Blueleaf honeysuckle (*L. korolkowii*) is also satisfactory. Fragrant honeysuckle (*L. fragrantissima*) doesn't seem a heavy bearer but fruits ripen in May, earlier than those of most any other shrub. Amur tree honeysuckle (*L. maackii podocarpa*), a very large, spreading shrub, has abundant autumn-ripening fruits which occasionally last until January. Use with caution because it can be a prolific reseeder and become a pest.

Flowers of some *Lonicera*, especially the vining species, have hummingbird appeal. Among the best in this connection are *L. heckrottii* and *L. sempervirens*, both of which have conspicuous flowers a good part of the summer. Best avoid the invasive Japanese honeysuckle (*L. japonica*); it becomes the gardener's curse in time.

Russian-olive and Firethorn

Russian-olive (*Elaeagnus angustifolia*) is a large spreading shrub included in wildlife plantings, especially in colder parts of the country, because of its extreme hardiness. The glaucous foliage stands out well if purple-leaved plants such as the Pissard plum (*Prunus cerasifera* 'Atropurpurea') are nearby, and the dull scaly fruits are eaten by birds in autumn. Cherry elaeagnus (*E. multiflora*), with distinctly green foliage that is rusty silvery beneath, has red fruits early to midsummer. Autumn elaeagnus (*E. umbellata*) is promoted by conservation agencies for its persistent silver to red fruits. None of these species is well adapted to the small property but have a certain role on land where they can ramble.

Firethorns (*Pyracantha*), with orange to red (rarely yellow) fruits, usually attract birds in autumn. If the fruits ferment on the shrub, as sometimes happens, don't be surprised to see inebriated robins nearby; as a rule the bounty is devoured before it gets to applejack stage.

Favorites in the North because of their relative hardiness are two scarlet firethorns, *P. coccinea* 'Lalandei' and 'Kasan'. Recent selections or hybrids are 'Government Red', 'Loboy' and 'Mohave' (long lasting fruits said to be spurned by birds). The numerous cultivars of Formosa firethorn (*P. koidzumii*) are best adapted to California and the South. Dr. William Kosar, *Pyracantha* breeder at the National Arboretum, points out that many of the new firethorns are exceptionally free-flowering, rivaling bridal-wreath and other spireas in spring for ornamental display. Note: if wildlife planting is done in an abandoned orchard, bear in mind that firethorns are susceptible to fire blight and scab. 'Mohave' is an apparently resistant cultivar, but where these diseases are known to be common, it would be wise to choose other kinds of plants.

Winterberry

Hollies have been mentioned elsewhere, but the deciduous winterberry (*Ilex verticillata*) deserves an extra word because its red fruits do in fact last well into the cold months before shriveling or being eaten by the birds. The shrub is an undistinguished dull green mass all summer but catches the countryman's eye after autumn leaves have fallen, a time when any color is welcome in the landscape. Try to obtain nursery-grown plants whose sexes are known. If this isn't possible, purchase a number of seedlings and discard excess males once a determination is made. As a last resort, where permitted, scan the roadside in wet areas in late autumn for good fruiting forms and sever a few small root offsets with a sharp spade, making sure to retain some of the original soil. Winterberry, also known as black-alder, is common in many parts of the East, but best refrain from digging where the plant it not abundant.

Several good fruiting selections of winterberry have been named and are gradually appearing in the trade. Among them are 'X-Mas Cheer', 'Copacon', 'Fairfax' and 'Shaver', the last three being cultivars named by O. M. Neal of West Virginia University, Morgantown, and distributed to nurserymen by the USDA (Glenn Dale, Md.). Dr. Neal has also named a male cultivar, 'Jackson', for its abundant pollen. Winterberry, which grows ultimately to 8 or 10 feet, is usually found in moist places in the wild but adapts to garden soil of average drainage. Although it is shade tolerant, a fair amount of light is necessary for proper flowering and fruiting, as is the case with most plants.

Other Shrubs

Bayberry (*Myrica*) is another dioecious shrub with fruits having a good attraction for wildlife, especially in sandy or brackish coastal areas where it is native and seems to perform best. The light gray, bloomy fruits are known to most eastern gardeners and are the source of the traditional bayberry candles. Along the New England and Long Island shores, northern bayberry (*M. pensyvanica*), whose foliage persists into winter, is the common species. In the South it is the evergreen wax-myrtle (*M. cerifera*), a much taller plant. Perhaps the most attractive is the California bayberry (*M. californica*), an evergreen best grown on the Pacific Coast. All three have long-lasting fruit.

Snowberries, coralberries and Indian-currants (*Symphoricarpos* species) have varying interest for the birds and might be included in a large plantation but are not in the first rank of garden shrubs because of their general coarseness and stoloniferous roots—an admittedly good trait on a difficult slope. I have grown snowberry (*S. rivularis;* formerly *S. albus laevigatus*) a few yards from a bird feeder for 15 years and have yet to see a bird eat the initially attractive white marblelike fruits, which often become disfigured with a fungus infection. The low-growing Chenault coralberry (*S.* x *chenaultii*) and one of its parents, the Indian-currant (*S. orbiculatus*), are better choices.

The native shrubby dogwoods, including gray (*Cornus racemosa*), silky (*C. amomum*) and red-osier (*C. sericea;* formerly *C. stolonifera*), are secondary ornamentals compared with their arboreal cousins but merit a place in medium-sized wildlife plantings for late summer fruits, which are subtly appealing. The pale blue ones of silky dogwood are among the handsomest. For a superb twig color combination in winter plant red-osier with its yellow counterpart, *C. s.* 'Flaviramea'. An Asiatic counterpart to red-osier, *C. alba* 'Sibirica', has the most vivid red winter twigs of any woody plant. Prune both very hard in late

The firethorn (*Pyracantha*) is usually grown for its bright orange fruit in autumn, but its spring flowers can be equally attractive.

Roche

winter every several years for best color. Most of the shrubby dogwoods, it should be added, are tolerant of poorly drained soil.

Man's regard for the fruit of the highbush blueberry (*Vaccinium corymbosum*) is so high that he doesn't think of this plant, intentionally at least, in terms of bird food. It has several ornamental qualities, including dainty bell-like flowers, leathery foliage that turns brilliant red in autumn after other shrubs have shed their leaves, and considerable winter twig character. With a judicious choice of cultivars fruits are available a good part of the summer. As an ericaceous plant, highbush blueberry requires acid soil and performs best when deeply mulched with organic matter. In the South, where the highbush doesn't thrive, selections of the native rabbiteye blueberry (*V. ashei*) have been made. Northwesterners of course have several handsome regional species of *Vaccinium* to choose from, in addition to *V. corymbosum* cultivars.

Finally, every so often, a species may not be an outstanding garden plant but has yielded a cultivar well worth growing. This is the case with the cutleaf staghorn sumac (*Rhus typhina* 'Laciniata'), a topnotch candidate for a medium-sized ornamental preserve because of its delicacy of foliage. It grows quickly, even in a gravel soil, and eventually forms a small coppice—a not undesirable circumstance for wildlife. The leaves, especially when assuming autumn tints of scarlet and orange, remind one of the artistry of a threadleaf Japanese maple, and the maroon-velvet fruits are every bit as esteemed by the birds as are those of the ungainly species from which the cutleaf form is derived. ☘

PORCELAIN VINE

The wildlife climber that undoubtedly attracts the greatest attention of visitors to the Brooklyn Botanic Garden in autumn is the porcelain vine (*Ampelopsis brevipedunculata*). At a certain stage of the ripening process, the berries are a striking turquoise. Because they ripen over a long period, undergoing changes of color that include green and lilac, the presence of this plant in the garden is all the more welcome.

A vigorous grower, the porcelain vine is esteemed by a variety of birds. Each autumn cedar waxwings, brown thrashers and orioles, none of which are particularly common birds in the city, may be seen devouring the mature berries. In fringe areas of the Botanic Garden where the porcelain vine has become naturalized, no serious attempt is made to remove it, since its occasional rambling is outweighed by the plant's attraction to wildlife—and beauty. This tendril climber, which has deeply cut leaves, is hardy as far north as coastal Maine. It is a rare plant in the nursery trade.

Seeds of this pretty vine are available to BBG members for the asking in the autumn of the year. Please send a stamped, self-addressed, business-size envelope to the Editor (Brooklyn Botanic Garden, Brooklyn, N. Y. 11225) by September 15. All queries sent earlier in the year will be automatically held for the fall crop. For information on joining the Garden see the inside back cover. ☘

If you weren't blessed with good garden loam,
Nature has presented you with . . .

THE CHALLENGE OF CHANGING PROBLEM SOILS

Margaret E.B. Joyner

If you think you've been stuck with a soil better suited to growing lichens than lawn, don't throw your hoe at the next Scott's ad. To varying degrees all cultivated soils need care and proper management to build and maintain their structure so that plant roots receive adequate air, water and nutrients. If you have a soil with problems, you just have a little farther to go than your luckier friends before you reach your goal. If the work involved seems overwhelming, you also have the alternative of taking advantage of your unique miniature ecosystem and catering to its peculiarities, rather than undertaking a large-scale transformation.

What is "Good" Soil?

All soils are various combinations of sand, silt and clay, further modified by organic material and stones. The ideal soil for most horticultural purposes is a loam composed of approximately two parts sand, two parts silt and one part clay, plus partially decayed leaves, roots and other organic matter. This soil is friable (crumbly), easily worked, drains excess water readily but remains moist, and provides nutrients and a good air supply to the roots. While it may not be realistic to aim for such perfection, virtually any soil can be improved.

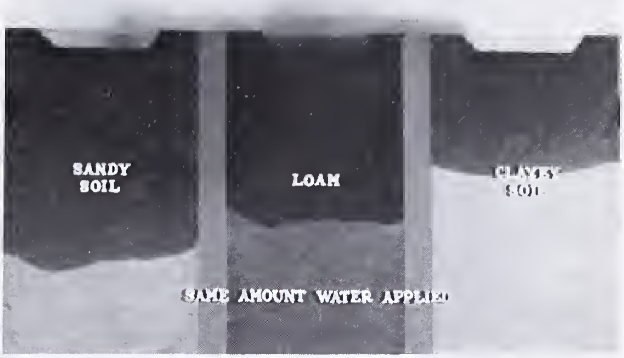
Soil Testing

Every one to three years, before applying fertilizer, have your soil tested for acidity (pH) and nutrient levels. (Your county agricultural agent can tell you how to have your soil tested at the state university or a private soil testing laboratory.)

Follow the sampling directions carefully to assure a representative sample. When you send in the soil, state what crops or plants you plan to grow and ask for fertilizer recommendations. By knowing the nutrient status of the soil and by correcting deficiencies, the home gardener can plan around problems (such as acidity) until they are rectified and can expect better response from the plants he chooses to cultivate.

Acid or alkaline conditions can occur in any soil type. These soils need to be adjusted closer to pH 6.5, the point at which most soil nutrients are readily available. Lime increases and sulfur decreases the pH. Both lime and sulfur come in forms that act relatively slowly (gypsum and ferrous sulfate) or quite quickly (hydrated lime and flowers of sulfur). Lime adds calcium and, in dolomitic form, magnesium; ferrous sulfate adds iron and sulfur—all are necessary nutrients for plants and soil microorganisms. (Aluminum sulfate will also acidify soil, but in large amounts, or in soils already high in aluminum compounds, it can reach toxic levels.) Don't become impatient if pH levels don't adjust quickly. Soils often have natural buffering (resistance to change), especially if they are high in clay. Excess applications of lime or sulfur can cause changes beyond the desirable range and necessitate additional corrections. It might take a while to get the pH to an acceptable level, but this is better than having buildups of excess, unwanted nutrients burning or adversely affecting plants.

Sandy, light or gravelly soils are porous, dry out quickly and are generally low in organic matter. Constant leaching soon depletes whatever nutrients are added. To improve soils of this type, generous amounts of peat moss, compost, manure, green manure, or other organic matter should be added and worked in deeply. The addition, if possible, of clay or silt-clay will also bring about significant improvement. The quality of light soils can be further enhanced by planting cover crops with penetrating, fibrous root systems, such as grasses, and annually turn-



A laboratory demonstration of the waterholding capacities of different soil types.

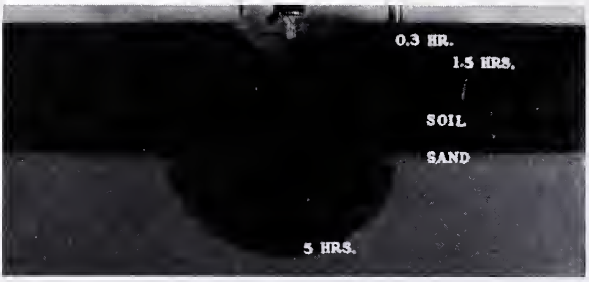
Photos: *Crops and Soils Magazine*

ing under plant residues. The application of commercial fertilizer should accompany the addition of any organic material; it will help "feed" the microorganisms that break down dead organic matter into its simple components, further enriching the soil.

Heavy clay soils are often water logged, late to warm in spring, poorly aerated and will dry to a brick-like texture. Not only do they impede root growth because of their low oxygen content, but, in wet periods, the high moisture-low aeration of clay soils can rot seeds and roots, inhibit beneficial microbial action and prevent the chemical transformation of minerals to forms that plants can utilize. These soils need organic matter and, if possible, sand to lighten them and to improve drainage and aeration. Materials should be worked in deeply (at least 8″) at a season when the soil isn't water-logged. (Cultivating a wet clay soil is not only difficult, but it can destroy what structure is present because the soil is so heavy and sticky.) Clay soils will often have large reserves of nutrients that become available for plant use as the condition and aeration of the soil improves, so be sure to have soil tested regularly and to follow the fertilizer recommendations.

Wet, poorly drained soils of any type may occur in a low spot or down hill from a spring or an area of heavy runoff, or anywhere on top of hardpan. If the problem is hardpan, it can be mechanically broken up. If the area is a low spot with no outlet, you can regrade it and install tile drains. Drains will also help to divert excess runoff from an uphill source and help prevent gullies and other erosion problems. If none of these solutions is practical or desirable, consider planting moisture-tolerant trees (tupelo, baldcypress, *Amelanchier*, dogwood, poplar) and shrubs (honeysuckle, dogwood, inkberry (*Ilex glabra*), forsythia.) Aeration is essential, especially for good lawns and flower and vegetable gardens, so sand and organic matter will probably need to be added to improve soil air circulation. Light, frequent fertilizing will gradually supply nutrients to plants, prevent waste and, if drainage problems are severe, prevent toxic chemical build-up.

Infertile or thin soils are common where construction has scraped off the topsoil and the remaining soil has not yet formed adequate topsoil or where the topsoil is naturally very shallow, as in many areas of New England. After deeply turning over or plowing in very large amounts of well-rotted manure, other organic materials, lime and fertilizer should be worked in. It may take several years of further applications of manure, lime and fertilizer and turning under cover crops, but a reasonably good soil can result without trucking in loads of costly topsoil. (See the following article for specific instructions for converting subsoil into topsoil.)



A layer of a different soil type under the topsoil can slow water absorption, causing it to be retained near the surface and depriving deeper roots.

Saline soils, most common in the Southwest, have an excess of neutral soluble salts and often have a white crust from evaporation. If the local water is low in sodium, heavy flushing of the soil will dissolve and leach the excess salts down into the soil without seriously disturbing the pH. Once the excess salts are reduced, normal conditioning, the addition of organic matter and irrigation can make these soils productive.

Fast, easy, one-step solutions to any soil problem are rare. The amount and duration of corrective effort will depend on the extent of the problem. But no matter how poor or difficult you think your soil may be, improvement is possible. Even the best soil needs regular cultivation, soil testing and fertilizing to keep it productive. More detailed information about soil management and improvement can be obtained from your county extension office or state university and the BBG Handbook No. 20, *Soils*. And don't discount the alternative—working within the limitations of the present conditions. By taking advantage of what you have you can encourage and preserve the plants native to your area and soil type, rather than trying to build up your soil to a loamy ideal. ✤

Subsoil Can Be Converted To Topsoil—Here's How.

In nature, subsoil is being constantly, though slowly, converted into topsoil. Experiments have shown that this conversion can be greatly speeded up by man. At the Ohio Agricultural Experiment Station land from which the topsoil had been completely stripped has been restored to productivity. The subsoil was treated with lime, manure, and fertilizer, and planted to various rotations of crops. Green manures, especially alfalfa, were freely used to aid the conversion.

Home gardeners may be interested in a subsoil-to-topsoil conversion that was carried out at the Brooklyn Botanic Garden. The subsoil area (hardpan) to be planted in lawn was first plowed in mid-August. Several loads of well-rotted manure were spread thickly over the plowed ground—about 3 to 4 times as much as would be used for ordinary manuring. Sand, ground limestone, and 5-10-5 were liberally applied, and the whole area well worked over with a rotary hoe. After being allowed to settle, the area was graded and seeded with Merion bluegrass. A vigorous lawn became established by June of the following season. Weeds have been a minor problem, no worse than in any lawn with which we have had experience. The same technique has been successfully employed for preparation of a vegetable garden site on subsoil. One word of caution: add enough coarse sand to insure soil aeration and good drainage.

By way of explanation: subsoil is often as rich as the overlying topsoil in all mineral nutrients except nitrogen and sometimes phosphorus and potash. It is lacking in organic material, and usually has a poor structure. These are the factors which must be dealt with in remaking subsoil. Nitrogen fertilizers must be added, and liming may be needed if the subsoil is too acid. Organic matter (in the form of compost, manure, etc.) is one of the essentials. If possible, soil should be planted to green manure crops for a year or two, but this is not essential. ✤

RESCUE FOR WILDFLOWERS

Janet Oliver Gyer

From THE GREEN SCENE (Pennsylvania Horticultural Society) Sept.-Oct., 1974.

The springs ran clear between steep banks clouded with pink-white mountain-laurel in full bloom in the woods. The area had the serenity of the shrine gardens I have visited in Japan. People had walked there for years. It was a natural park of oak, beech, mountain-laurel, azalea, mosses and the beautiful low wild flowers of acid woodlands—partridge berry, trailing-arbutus, lady's slipper, pipsissewa.

A sign appeared, followed by great yellow earth movers. The mountain-laurel woods had been sold along with the adjoining meadow where a shopping center was to be constructed. I talked with the real estate agent, landowners, developer's representative, planner-surveyor, and realized that there were many reasons for the land to be used "sometime." But couldn't resources be saved, couldn't some of its wealth of wild plant material be transferred to gardens where it could grow and from which it could be propagated?

On my first visit to a real estate agent I learned that cooperation abounds when a project can be useful to the public and the developer. When I expressed my concern for the mountain-laurel woods, the agent assured me that his profession isn't made up of ogres rushing to destroy the last vestige of our natural heritage. In fact, he would welcome a visit from interested local people at another site he was planning in order to assess the natural plantings and help save the best of the natural landscaping.

I needed to find a group of interested people, so I presented a slide show to the County's nature club. Those interested in the program were invited to a picnic in the woods during mountain-laurel bloom. The owner was not free to join us, so we sent him some of our suggestions for saving at least a portion of the woods. Then our group dispersed for the summer. Word came of the New Jersey ban on open burning set for January, 1973: "sometime" became a rush to clear all the land before the end of the year. The developer had listened to us courteously but now he told us we should hurry to remove any souvenirs we wanted before the mountain-laurel woods was posted against trespassing. Hastily organized trips did rescue plants, but not enough. One hundred and fifty acres were bulldozed and burned.

From this effort we have some successes. Tiny mountain-laurel seedlings safely lifted to their new homes in their moss nurseries have doubled in growth in one year, and we did not lose a single seedling. It is now time to share them with fellow gardeners as donations to a plant society sale. Moss is now high on my "want list" for rescued material. How happily woodland plants nestle in the smoother mosses, drawing moisture and sustenance from their protector. Even trailing-arbutus cuttings manage to thrive in a moss nursery. Partridge berry fortunately found its way to a group of Girl Scouts building terrariums just before the woods were destroyed in November. And the bits and pieces of partridge berry broken from the larger plants weren't wasted. I placed them in a flat of sand and peat moss covered with a plastic bag "greenhouse" where they obligingly rooted at every node.

Recently, we have had other successes with cuttings of difficult-to-transplant material. Our groups of interested gardeners are branching out from rescuing plants to rescuing endangered species by means of cuttings. Again, we've had a positive response to a positive suggestion. Very often permission will be granted by park or public garden officials or private property owners after a personal visit and assurance that proper cutting and collection methods are to be used. The result is access to heretofore off-limits materials.

Mountain-laurel (*Kalmia latifolia*)

Roche

Collecting Seeds

Collecting seeds is fun because it encourages new gardeners to really look at their plants. Sharing seeds with other gardeners makes it possible to insure pockets of bloom in our backyards. What a thrill this year to find the tiny strawberry-like trailing-arbutus seed pods before the ants! We'll be able to share the seeds with gardeners far from the mountain-laurel woods.

In New Jersey the Pine Barrens Conservationists work with road crews to advise them of the best dates for cutting along the roadsides in order to allow full seed production of roadside flowers. A good rescue project for a garden club, or even an individual, would be to chart seed-maturing dates to protect roadside bloom—and to interest the local Highway Commissioner in the project.

Lady's Slippers

Now that I am acquainted with a number of groups interested in wildflower rescue, I can plan a trip whenever plants are in danger of destruction. As for the time to move plants, the late Doretta Klaber wrote in *Rock Garden Plants* that she did not transplant in winter or when there was a long dry spell in summer. She found August to November a good transplanting season and assured us that plants can be moved in spring when they are at the height of their powers.

I wish I'd paid attention to her because the lady slippers were in bloom when I first visited the mountain-laurel woods. At that time I thought that the developer's clearing was years away and I could wait until very early the next spring to transplant them. We went back to the woods toward the end of the lady's slipper blooming cycle to pollinate them, a project we pursue with our own plants. Agricultural practices and gypsy moth sprays often destroy the bees that pollinate native orchids and it is a fascinating service to help their propagation along. It is a simple matter to pollinate lady's slipper orchids; the pollen is the yellow, waxy sac at the slipper opening, one on each side. Take a small stick and transfer the pollen sac from one flower and attach it to the second flower's stigma, which is located just under the lip. In our patch we were not getting many seed pods until we artificially crossed the blossoms. Now four out of five set seed. We went back in the summer to show friends our hidden woodland and found that 10 out of the 15 plants in one patch had set seed.

The mountain-laurel woods taught me that advance planning is the key to successful wildflower rescue. There is no point in hand-wringing after the construction project is approved by the Planning Board and others at the community level. I keep in touch with builders. At a recent Planning Board meeting a developer was beset by many problems. My suggestion that our group enter the property to save wildflowers before construction resulted in his inviting us to remove plants.

After we received permission for the rescue trip, a scouting party composed of

Louis Buhle

Wild orchids other than lady's slippers, such as the showy orchid (*Orchis spectabilis*), are also in need of protection from the commercial developer.

several of our more knowledgeable members visited the woodland to prepare a list of plants that could be rescued. This was circulated to the gardeners so that they could have their planting sites prepared before digging. We reminded them that native plant material will do best when its garden habitat duplicates its natural one. Habitat requirements are set forth in several books which I took along to the rescue trip. My favorite is by Edgar T. Wherry, *Wildflower Guide,* a Doubleday

Gottscho-Schleisner

Spotted-wintergreen (*Chimaphila maculata*), with its waxy, delicate flowers, would be high on the list of flowers to be saved.

Nature Guide. Dr. Wherry has long championed the idea of wildflower rescue in areas subject to destruction, but he urges gardeners to provide conditions for the plants to reproduce (possibly under a gardener's help) by seeds, runners, offsets. Only in this way is a plant saved, because there is bound to be some loss in the transfer of a plant from one site to another. A good help for me in analyzing pH and other requirements is *Growing Woodland Plants* by Clarence and Eleanor G. Birdseye, a Dover reprint.

Digging Demonstrations

Before digging begins, the group is shown how to dig a large sod, and how to transfer a sod to a piece of plywood or large tub with a good supply of the woods' soil. A demonstration plant was dug so root structure could be observed closely. Seeing how deep and how far the roots traveled seemed to affect the care the rescuers took in their chore. And it is a chore. Until you have hauled a heavy plant through rough woodland you don't realize how simple it is to just buy a plant. Most wild plants are accustomed to the accumulated woods' duff, which provides for them the best compost of all. But excellent compost can be made from common garden waste. The neatly bagged leaves and grass clippings on every suburban street left for disposal trucks would make excellent compost for native plants.

Suggestions for Rescue Missions

- Obtain permission from the appropriate authority (state, municipality, landowner, builder).
- Work with environmentalists, nature club, garden club, scout, school or church group.
- Set a definite date for a wildflower rescue trip. Explain that bootleg trips could endanger the project.
- Avoid large-scale publicity; it draws too many people.
- Prepare a handout covering plant material to be obtained and suggestions for maintaining it, including the importance of watering.
- Advise participants to bring equipment such as: shovel, axe, pruning shears, plywood (to put under plants when carrying), burlap (to wrap roots), plastic bags for small plants, cooler and ice to protect small plants from car heat, leaf bags for large plants and to hold soil to reproduce habitat in new area. ❧

A LESSON FROM THE FOREST

Have you ever walked in an *old* redwood or hemlock forest and noticed how sparse the vegetation is on the ground in some areas? One reason is that deep shade prevents most seedlings from growing. Another is that the needles shed over the years by monarchs of the woodlands build up to form a blanket, covering the soil. Underneath it is always moist, even in a dry year. And the blanket itself discourages the germination of seeds. This is, in fact, Nature's mulching; a way of saving plant life during dry cycles.

The idea can and has been adapted by natural gardeners. Nurseries today stock a wide variety of mulches—buckwheat hulls, cocoa beans, ground pine bark, etc., but the shredded leaves from the previous season's lawn-tree growth, pine duff or old sawdust can be used just as effectively as commercially available mulches.

The importance of mulching was brought home to easterners in the drought years of the 1960's. Much of the *western* portion of the United States has recently had less-than-average rainfall, and a new generation of California and Rocky Mountain gardeners is turning to mulches to keep gardens, even informal ones, green, healthy and more-or-less weed-free. If you would like more information, see the Brooklyn Botanic Garden *Handbook on Mulches*. (Ordering information for this and all BBG Handbooks is on the back cover of this issue.) ❧

THE LAWN

Warren G. Kenfield

I really like Lawns. They have the pure clean simplicity of a freshly painted floor, or a bolt of mono-colored cloth. The economic theory of "cost vs. benefits" is apropos, but I prefer a bed of moss, the subtle satisfaction of a stretch of periwinkle, or the inviting expanses of an unmowed grassland rippling in the breeze.

The Lawn is one of the most interesting sociological and psychological phenomena of our times. It is a sort of living fossil, having evolved several thousand years ago in the history of our Western European culture. Not a fossil in the sense of the coelacanth, which fish, until found recently off the African coast, had been considered extinct for 70 million years. It is still very much at home in those waters. Lawns, to the contrary, are kept alive only by an exorbitant amount of nursing and babying, otherwise they would disappear, to become as extinct as the dodo.

The Lawn arose early in our cultural history, certainly before the days of gardeners and landscape architects. When we first domesticated cattle, goats and sheep, we kept them fenced and tethered close to the hearth. This caution was to protect them from marauding animals, especially human neighbors. (The custom of fencing still persists, for though we have made the former animals extinct, the latter still exist.)

Vegetationally, the practice was a logical and esthetic coincidence. The hooves of the animals compacted the soil to walkable firmness. By their excretions, a high fertility-level was maintained. By trampling, only grasses survived. By grazing, a close-cropped sward was maintained. The result: a Lawn, a beautiful expanse of emerald green.

Times have changed. The original topsoil has been exchanged for "fill", called top-soil by the man who sells it to you. The tethered front-yard cow has vanished, replaced by chemical fertilizers and herbicides (quite fine in their limited way) and by mechanical monsters (that keep the repair man busy, even when Junior does not pour water in the gas tank). The Lawn? A living fossil in a modern human zoo. ✤

Reprinted, with permission, from *The Wild Gardener in the Wild Landscape, The Art of Naturalistic Landscaping*. Hafner Publishing Co., New York and London, 1966.

Minimum grass means low maintenance but high interest in the diverse self-sustaining plantings.

J. Horace McFarland

A HOUSE IN THE WOODS

Richard H. Goodwin, Sally L. Taylor, Betty F. Thomson and William A. Niering

In Waterford, Connecticut, a contemporary, cedar-sided house was constructed in 1969 in a woodland consisting of young black oak, black birch, hickory and red maple, with an understory of dogwood and mountain laurel. Here the owners, in order to reduce their feeling of claustrophobia, have gradually pushed back the forest border. Sloping banks adjacent to the house site have been planted with native rhododendron, bearberry, juniper and bayberry, and were heavily mulched with wood chips to eliminate weeding chores. The deciduous woodland has been judiciously thinned and underplanted with evergreen mountain laurel for accent. The trees remaining in the area around the house have been high-pruned to make light more available to understory plantings of native azaleas and to improve air circulation in summer. Tall unsightly dogwoods, which grew up in a crowded early forest, have been removed, and smaller specimens have been allowed to assume their natural shape within the openings.

The forest floor initially had maple-leaved viburnum, low blueberry, poison-ivy and several species of attractive ferns (Christmas, New York, grape) as well as small oak and dogwood seedlings. The poison-ivy has been selectively eliminated with herbicides. Rough mowing twice a season with a sicklebar, the first after the English bluebells and wild geraniums have flowered, has promoted some grass cover and moss mats. This type of management has converted the forest to an intermediate state of open clearings with scattered large trees, clusters of native deciduous azaleas and laurel, and clumps of fern. Unwanted weedy species have been eliminated by mowing before they have gone to seed, and it is surprisingly easy to dodge the fern clumps and seedlings one wishes to preserve. Oak and dogwood saplings have been saved. It is hoped that these will eventually replace the shallow-rooted maples. A planting of hemlocks around the periphery of the property will, in time, give privacy from traffic along the road.

One small lawn area located over the septic system has been bounded in part by a planting of daylilies and in part by a well-defined woodland garden—features that bring to an end the temptation to embellish the remaining five acres of woodland, which thrive on neglect. This woodland is traversed by a path which has been embellished with native wildflowers. One trip a season with pruners in hand keeps this trail in fine shape. ⁂

Louis Buhle

Shining club-moss *(Lycopodium lucidulum)* often appears in the leaf debris on a woodland floor.

Reprinted, with permission, from the Connecticut Arboretum *Bulletin*, No. 21.

Henry Francis duPont Winterthur Museum

The wooded areas at Winterthur Gardens in Delaware are planted for ground level, eye level and overhead interest.

GIVING LAND FOR CONSERVATION

Russell L. Brenneman

Private action has been a significant ingredient of land conservation and is likely to remain so. Techniques of giving have become sophisticated and the best approaches are influenced both by the tax law and by the law applicable to real property. An article of this length can touch only on the high spots of land philanthropy and suggest avenues of thought.

Why Should I Give My Land?

Perhaps you shouldn't. Obviously, not all land should be preserved. Consideration should be given to the unique characteristics of your land. Ask yourself questions such as these: Are you the owner of an ecologically important resource, such as a salt marsh or an aquifer? Is your land located near any property presently dedicated to conservation or recreational uses? On the master plan of your township, county or state, how has your land been designated for future use? The answers to these questions may suggest to you whether it is worthwhile to pursue the preservation of your land.

Your economic circumstances may be such that you cannot sensibly pursue an outright gift of your land. While land philanthropy has ceased to be entirely a rich man's game, nonetheless those in the higher income and estate tax brackets reap the greatest benefit from charitable contributions. The fact that you cannot give your land outright should not, however, deter you from exploring the possibilities of a transfer. It may be possible for you to arrange the purchase of your land by a non-profit organization for less than its full value, whereby you recover a portion of that value and the organization receives a bargain. Also it may be that you can transfer only a portion of your rights in the land—the development rights—and retain and transfer to your heirs the land itself.

Where Can I Get Advice?

Your township or county planning office can probably provide some insight into the relative importance of your land for development/conservation/recreation purposes. If the land is located near property dedicated for an existing public use, you can approach the authority which is managing the public program. If you are interested in a transfer to a private land charity, there are a number of such organizations, and if you get in touch with one of them, you will receive guidance to others. The Nature Conservancy, which is probably the best known national land-conserving organization, in all likelihood has a chapter in your state. Educational institutions may have programs which interest you, or your town conservation commission can give you help. There also may be a state or local land conservancy or trust which can aid you.

Competent legal and tax advice will also be needed. As noted above, there is nothing particularly complicated about these transactions, but you should be represented by a lawyer who has considerable ability in the real property and tax fields; the person who handles your estate planning may have these qualifications. If you are at a loss concerning where to turn, the organization with which you are dealing will probably have the names of several lawyers who have had some experience with such matters.

What Sort of Controls?

You may be reluctant to transfer your land with no strings attached. There may be a concern that management policies of the recipient organization may change. In dealing with a public agency, you may not entirely trust the political process to provide the needed care. Without any lack of confidence in the organization, you may be concerned about very real contingencies such as possible condemnation for a conflicting public use. Often with the enthusiastic cooperation of the recipient, you may be able to build certain restraints into the transaction. These may be as mild as a covenant by the recipient against actions of which you disapprove or as stringent as conditions requiring a re-vesting of title upon breach. The manner in which these covenants and conditions should be imposed on the land in the most durable fashion will be determined by the law of real property which obtains in your jurisdiction. Consideration should be given to creating a "watchdog" function in some other agency which would be able to enforce the covenants or hold the title if the condition is broken. Thus, a deed to a public agency might provide for a vesting of title in the Nature Conservancy upon a breach of condition.

What is a Conservation Easement?

The term "conservation easement" has come to mean a negative "interest" which prevents the owner of the land from using or developing it in certain ways. The fullest expression of the concept is the transfer of all development rights to a conservation caretaker. More modest examples include scenic easements and streambelt easements. While the concept is relatively new, conservation easements have attracted considerable interest as land controls in both private and public programs.

The alternatives are many and the services of a lawyer are an imperative. But don't let these be a barrier if you feel your land will have value for future generations by your gift of it for conservation purposes. ✤

MAKING ENVIRONMENTAL CONSERVATION PROJECTS WORK

Alice Harvey Hubbard

Most successful projects seem to follow the same general pattern, whether they are neighborhood efforts or nationwide programs.

(1) **A concerned individual or group recognizes a need and determines to do something about it.** That need may be a recreational area, the elimination of water pollution, a community forest or a soil conservation district. Whatever it is—the most successful projects are those which fill a need in the community or nation.

(2) **An analysis is made of the problem—with the advice of experts sought where necessary.** On the whole, the most successful groups have been those which made a careful analysis of the problem before they tackled it, drawing upon the advice and experience of experts. When this is done, the difficulties likely to arise are anticipated and plans can be made to meet them.

(3) **Teamwork is important.** Teamwork is the common denominator of every project. When the strength of individuals and groups in the community is combined, each taking a share of the responsibility, the possibilities for accomplishment are limitless. This is because, together, they represent a cross-section of community life and thinking.

(4) **A plan of action is worked out.** Even when only a small segment of the population is concerned about improvement of an area or conserving part of it, a plan of action may make the difference between a permanent achievement and a mediocre attempt.

(5) **A program of public education is undertaken.** There is little purpose in talking about the restoration of a sick watershed to people who do not know what a watershed is or how its condition affects them. A farmer is likely to be indifferent or even hostile toward a soil conservation district until he understands how it operates and what it will mean to him and his family. All too often voters go to the polls and vote against an issue simply because they know nothing about it, and their general inclination is to vote against anything that will increase taxes. One of the essential ingredients in almost any successful project is a well organized program of community education.

(6) **The project is made the responsibility of the whole community.** In its own way, each community is a little America, representing what this nation stands for and its democratic processes. The most worth-while project, regardless of size, is one in which the community is led, or inspired, to help itself rather than have something done for it.

(7) **Finances are not always a major problem.** Where and how to raise the necessary money is a primary consideration in undertaking almost any project. When large sums are needed, as in the acquisition of the California redwood forest, big fund-raising drives must be planned and executed. Indeed the successful group is usually one that has made the financing of its project a challenge rather than a problem, an opportunity for members to prove their ingenuity.

(8) **Successful groups work in harmony with public officials.** Many groups have been frustrated in their efforts to carry out very worth-while projects simply because they overlooked the fact that these officials are often in the best position of anyone to help them.

(9) **Use contests as a means of creating interest in projects.** Competition has a strong appeal to most people. A spirited contest, properly conducted, is useful in carrying out most projects, especially where the support of young people is sought.

(10) **Interest is sustained by publicity and progress reports.** Starting a project is one thing; following it through to successful completion is another. Publicity for publicity's sake is never desirable, but publicity to keep a long-range project going by means of achievement reports is sound business practice. In this connection the local newspaper editor is the best ally.

(11) **Provision is made for the maintenance and future security of the project.** It is sad that even the most public-spirited groups will sometimes spend a tremendous amount of time, money and effort on a project, only to have it become forlorn and forgotten in later years because the members failed to provide for its maintenance or its future security. This is often true of beautification projects and sanctuaries, or areas that have been set aside in their natural state. These precautions should be considered a part of the project, an essential to its successful completion.

(12) **The determining factor in the success of all community and conservation projects is enthusiasm.** One may ignore any or most of the rules for success in carrying out a project and still succeed, but enthusiasm is the lifeblood of all such projects. Without it the best of projects are doomed from the outset, for most of them entail a great deal of hard work, much of which is routine and unglamorous. A group may have every other ingredient for success, yet fail miserably for lack of enthusiasm. On the other hand, it may face seemingly insurmountable difficulties, with little but boundless enthusiasm—and do the job. ⁂

AN INVITATION TO JOIN AND ENJOY

> **A man does not plant a tree for himself;**
> **he plants it for posterity.**
> **—Alexander Smith**

ALL who read these lines and are interested in the out-of-doors and the beauty of living things are cordially invited to become Members of the Brooklyn Botanic Garden. The dues are $15 annually. Memberships make fine gifts, too. For many, the Botanic Garden means spiritual enrichment, and they find satisfaction in contributing toward its support. Others enjoy the Membership opportunities, which include a subscription to PLANTS & GARDENS, occasional plant and seed "dividends," popular short courses at reduced rates and other benefits. Why not get pleasure from both?

.... cut off here ....

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Vol. 33 No. 2
(Summer, 1977)

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Staff for this issue:
FREDERICK MCGOURTY, JR., *Editor*
MARGARET E.B. JOYNER, *Associate Editor*
with the assistance of MARY ANN MCGOURTY
and the Editorial Committee of the Brooklyn Botanic Garden
VIOLETTE CONNOLLY, *Secretary of Publications*
ELIZABETH SCHOLTZ, *Director, Brooklyn Botanic Garden*

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Roche

A mature planting that guides the eye from the yews and azaleas to the rhododendrons and up to the dogwood.

Letter from the Brooklyn Botanic Garden

Seven years have passed since the last edition of the BBG woody-plant source guide, and the time is ripe for another look at what is available from American nurseries. As with all businesses, some nurseries have come, others have gone. Also, there are some relatively new plants in the trade, and a few have more-or-less disappeared.

This new Handbook is the Botanic Garden's continuing response to letters and calls from Members and friends asking "Where can I buy ________?" This is strictly a public-service issue because of the inordinate time and cost involved in preparation, and it is noteworthy that not one of the nurseries cited was asked to pay for inclusion. By the same token, the Botanic Garden as an eleemosynary institution does not endorse any particular firm. The Handbook is simply an attempt to get gardener and nurseryman together concerning 1200 trees and shrubs, some of them being rare jewels in danger of disappearance from the trade.

This source guide is not meant as casual bedside reading, although the basic approach of grouping trees and shrubs by major categories (e.g., Deciduous Trees Planted for Foliage, Flowering Trees) may help gardeners and landscape designers get to know the variety of choices available. Essentially it is a reference work, and space limitations have permitted only brief descriptions of plants by the Editor. The main purpose of the Handbook is to make easier the horticulturist's search for particular plants.

Neophyte gardeners should not be dismayed by the extensive use of botanical names. They are the precise horticultural language and will greatly increase your chances of getting exactly the plant you desire. Wherever possible, common names have also been given, but even here it should be said that "common" names often vary according to geographical region. Note that there are separate indices for botanical and common names, beginning on page 92.

All readers are urged to turn to pages 4-6 and 82 before reading the text. Letter code sources refer to retail or mixed retail-wholesale nurseries, number codes to exclusively wholesale nurseries. The latter are not equipped to sell directly to the home gardener. Unless you are a nurseryman, please do not attempt to purchase plants from strictly wholesale firms.

It takes the guidance of many people before a Handbook can go to press, and we would like to express appreciation to all who have lent a hand. A word of particular acknowledgment goes to Pamela J. Harper, Seaford, Virginia; Gary Koller, Arnold Arboretum, Jamaica Plain, Massachusetts; Sylvester G. March and colleagues, National Arboretum, Washington, D.C.; J. C. McDaniel, University of Illinois, Urbana; Stephen A. Spongberg, Arnold Arboretum; Conrad J. Wrzesinski, Middleton, Wisconsin. And bouquets of mountain-laurel to my wife Mary Ann, who undertook the complicated task of keying plants to sources, and to Associate Editor Margaret Joyner, who is responsible for the intricate layout.

Yours for better gardening.

Sincerely,

Frederick McGourty, Jr.

Editor

BUYING TIPS FOR TREES AND SHRUBS

The enterprising gardener usually purchases plants from a variety of sources—local nurseries, garden centers, landscape enterprises, hobby gardens and mail-order firms. Since the listings of each firm are necessarily limited, it is frequently necessary for the home gardener, and even the landscape specialist and nurseryman, to engage in time-consuming searches for choice and uncommon plants. Often the hunt is a frustrating one, and less satisfactory plants must be substituted for ones originally desired. While the 1,200 woody plants cited in this Handbook by no means include all that exist in the American nursery trade, it is hoped that this edition of *Nursery Source Guide* will make the search easier.

Should specimen-size trees be desired, they are usually best purchased locally, especially if they are balled and burlapped ("B & B"), for the cost and danger of shipping large plants is substantial. Some regional firms that specialize in uncommon species of landscape size are listed in the Handbook, and the horticultural enthusiast must be prepared to drive some distances to obtain such plants if the nursery does not have a truck delivery service in the particular area.

A local nursery may often try to assist you in obtaining larger sizes of uncommon trees. You can assist by providing the wholesale sources of particular plants, cited by number code in the rear of this Handbook. (The telephone can minimize the frustration of such a hunt, especially in the busy season. Telephone numbers along with addresses are given in the Source List beginning on page 83.) However, it is always wise to order far in advance, since desirable plants are often sold out early in the season.

Many fine shrubs and trees are unavailable locally, but there are mail-order firms that will supply these plants, generally in modest sizes. With the exception of evergreens and a few other plants that nurseries usually ship in pots or with small balls of soil, woody plants are sent bare-root, with plastic wrapping and sphagnum or similar material to keep the roots from drying out. Bare-root plants may be sent only when dormant, that is, in the cooler months of the year. The common shipping seasons, depending on climate, are October to December and March to May.

Because autumn is usually the least busy shipping time in the nursery year, it may be expected that orders receive more attention at that time than in the spring months. The gardener may also be sure that plants shipped in autumn will have been freshly dug. Because of the large volume of business in the short spring season, some large nurseries dig plants in the autumn and store them in cold houses over winter. Although storage methods have improved in recent years, plants often are "worse for wear" from such treatment.

Where the climate permits, generally Zone 5 (Arnold Arboretum map, see Centerfold) and southward, autumn delivery has other advantages as well. Many shrubs and trees planted in fall will become quickly established and make better growth in the ensuing year than those planted in spring. They may also require less watering in summer since their roots will be better established.

Regardless of the time of year a shrub or tree is planted, it is advisable to mulch it well with pine needles, ground bark, wood chips or similar material (*not* peat moss). Protect with fine mesh wire if rabbits or field mice are common. For planting instructions see any basic gardening book—or BBG *Gardening Guide* Handbook (available from the Garden for $1.75).

M. Joyner

A good garden center or nursery is the best source of healthy, varied plants as well as professional information on planting and maintenance.

Unless a cold frame is available, spring delivery is normally preferable for very small sizes or for plants of borderline hardiness. Spring planting is advised for a few trees and shrubs in bare-root condition. Most notable are cherries and other members of the genus *Prunus*, golden-rain-tree, tamarisk, broom, rose-of-Sharon, some maples and oaks. Magnolias and tulip-tree, even with a good soil ball, should not be planted in autumn. Very small evergreens are also more safely planted in spring.

Consult your local arboretum or county agent if you are in doubt about an appropriate planting time in your area for a special shrub or tree. A member of the arboretum staff or agent may give more explicit information about the hardiness of a plant in a particular area, since climate zones, while very useful, are but general guides.

Mail-order firms usually ship larger sizes by United Parcel Service, smaller sizes by Parcel Post or sometimes by bus. If one chooses Parcel Post, the extra charge for "special handling" is a good precaution. When shipments are made across the country, air freight is well worth the extra expense.

Most plant losses are due to transit delays, not to faulty packing. Mail-order firms are working with the postal authorities to improve service, which, as gardeners know, has left something to be desired in recent years. It is hoped that the reorganization of the post office will eventually be beneficial to those who order by mail.

A word should also be said about commercial garden centers, which have proliferated around the country in the last ten or fifteen years. Increasingly, the plants they sell are container grown. A good garden center will have a substantial variety of these plants, purchased usually from large wholesale firms. To the home gardener, the chief convenience of such stock is that it extends the planting season beyond the spring limits.

If one purchases container-grown stock in summer, it is wise to wait until a cool, cloudy day before transplanting it to the garden. Be careful to inspect the root ball upon freeing the plant from the container. If roots encircle the outer rim of soil, make several sharp—but not deep—cuts to break the outer white mesh of roots. Otherwise, there is danger of a root system that may eventually girdle and perhaps even kill the plant. It is always wise to remove some top growth to compensate for root loss.

How to Use This Book

In this Handbook, every effort has been made to evolve as simple a key as possible. The following paragraphs explain the key and various designations used in the plant listings:

Numbers in parentheses after a botanical name refer to hardiness zones—the northern limit of winter hardiness of a tree or shrub. (See Hardiness Map, Centerfold.) "B" after a hardiness code number indicates that the plant is hardy in the southern half of a particular zone. Hardiness varies, even within a species, and depends in part upon micro-climates within each garden.

When hybrid trees or shrubs are cited, the two parents are linked with an **"x"** in parentheses after the botanical name. For example, the red horse-chestnut is listed botanically as *Aesculus carnea* (*hippocastanum x pavia*).

Parentheses after a botanical name are also used to denote synonymy. *Magnolia virginiana* (*glauca*) indicates that the correct name is *M.* (abbreviation is this instance for *Magnolia*) *virginiana*, but readers may find the tree listed in some catalogs under the incorrect name *M. glauca*. When ordering, give both names.

Letter codes following a description refer to retail (or mixed retail-wholesale) sources. **Number codes** refer to exclusively wholesale sources. For more details see the code explanations beginning on page 83.

The heights attributed to trees and shrubs are considered in terms of average garden conditions. In their native state, or with great age or under special conditions, trees and shrubs may grow taller than the heights cited.

Flowering times are for the New York City area, and they merely represent an average. It is not uncommon, depending on the particular year, for a plant to flower two weeks earlier or two weeks later than usual. Summer flowering time is especially variable. If you know the flowering time of a special shrub or tree in your area, it will be easy to guess when others will be in flower by cross-checking with the "indicator" plant.

An asterisk (*) after the nursery codes indicates that the plant is listed in far too many catalogs to cite fully. One may assume that such plants are among the most common in the trade and can usually be obtained locally with no difficulty.

Boxwood and English ivy complement a half-timbered Tudor house moved to the U.S. from England and reconstructed.

J. Horace McFarland

DECIDUOUS TREES PLANTED FOR FOLIAGE

Those useful as shade trees marked "†"
(See also Flowering Trees)

Conifers That Lose Leaves In Winter

Larch

Larix decidua (europaea) (3-2B)
European Larch
Pyramidal tree to about 75 ft., often with gracefully pendulous branchlets at maturity. Fine yellow autumn color. CB, CO, DU, FO, HO, MU, SH, SI, WE, 11, 19, 27.

Larix kaempferi (leptolepis) (4-3B)
Japanese Larch
Tall-growing, openly pyramidal tree with horizontal branching. Rather fast-growing. FO, GI, HG, HO, LI, MU, SH, WE, 1.

Larix occidentalis (5)
Western Larch
Narrowly pyramidal tree with short, horizontal branches. The tallest of the larches, occasionally to over 200 ft. in the Pacific Northwest. SI, VA, 37.

Dawn-redwood

Metasequoia glyptostroboides (5-4B)
Graceful tree, strongly pyramidal. Under favorable conditions it is capable of growing 60 ft. in 20 years. Good reddish-brown autumn color. CO, EI, FO, GI, GU, HA, KE, LI, NE, SH, SI, TL, WC, 6, 10, 11, 17, 22, 27, 36.*

Golden-larch

Pseudolarix kaempferi (amabilis) (5)
Fine, tall, openly pyramidal tree with 2-in.-long needles in clusters. Golden-yellow autumn color. Good winter effect with short, stubby spur branches. WE.

Bald-cypress

Taxodium distichum (4)
Densely pyramidal, sometimes nearly columnar, large tree with attractive shredding bark. The woody root-projections or "knees" of this native southern swamp tree occur only in moist soil. Adaptable to a wide range of growing conditions. Refined small comb-like needles. CB, DA, DU, EA, EI, FO, HG, LI, NE, PA, PW, SI, WE, 1, 6, 11, 14, 19, 27, 38.*

Other Deciduous Trees

Maple

Acer buergerianum (6)
Trident Maple
Small, spreading tree to 25-30 ft.; refined habit. Short, 3-lobed leaves turn red in autumn. Leaves vary in size; forms with smaller leaves are good bonsai candidates. GR, HO, SI, 4, 22, 36.

Acer campestre (5-4B)
Hedge Maple
Rather slow-growing, round-headed tree, eventually to about 25 ft. Because of its small leaves and dense habit, it is often used in Europe as a clipped hedge. BP, EI, FO, GR, LC, LI, TL, 1, 10, 19, 27, 28, 33.

Acer circinatum (5)
Vine Maple
Shrubby small tree from the West Coast, rather like *A. palmatum*. Attractive in flower. Good autumn color. Tolerates partial shade. GR, LI, SG, SI, SK, 4, 33, 37.

Acer davidii (6B)
David Maple
Small to medium-sized tree from China. Younger wood, striped white, is effective in winter. Leaves mostly unlobed. GR, LL, 19.

Acer ginnala (2)
Amur Maple
Dense shrubby tree to 15-20 ft. Small leaves turn brilliant scarlet in autumn. A good hedge plant in cold climates. CO, FO, GR, GU, HG, IN, LT, MA, NE, PV, PW, SH, SI, TL, 1, 11, 16, 17, 19, 27.*

Acer griseum (5)
Paper-bark Maple
Superb small tree with outstanding cinnamon-colored, peeling bark. This species from western China has year-round interest. Leaves trifoliate. BP, GI, GO, GR, KI, LC, LI, OL, PA, RO, SP, TL, WC, WE, 1, 8, 11, 14, 16, 27.

Acer grosseri hersii (5?)
Hers Maple
Small tree from central China. Conspicuous red twigs in winter. PA, 16.

Acer japonicum 'Aconitifolium' (5)
Half-moon Maple
Small tree with distinctively cut leaves that have fine red autumn color. Variable but usually very handsome. GR, KM, OL, PA, WA, WE, 42.

Acer japonicum 'Aureum' (5)
Golden Full-moon Maple
Small tree with yellow leaves. More attractive than most with such foliage. GR, KM, PA, SL, 36, 42.

†Acer macrophyllum (6)
Big-leaf Maple
A common, sizable West Coast tree with the largest leaves of any maple—as much as 1 ft. across. Casts dense shade and needs much room for full development. Generally unsatisfactory in the Northeast. SH, YB, 4.

†Acer negundo (2)
Box-elder
A weedy maple to 50 or 60 ft. with large compound leaves. Suited only for cold, windy areas where other trees fail. GU, TL, VA, YB, 38.
Selected Form: **'Variegatum'.** Handsome tree with variegated-silver leaves. 33.

†Acer nikoense (6-5B)
Nikko Maple
Rather slow-growing vase-shaped tree, eventually to 40 ft. or more. The trifoliate leaves have good red-to-purple autumn color. Now considered synonymous with *A. maximowiczianum*. GO, 16.

Acer palmatum (4) (some forms less hardy)
Japanese Maple
A variable but always attractive slow-growing small tree or shrub. Refined small leaves with usually good red autumn color about two weeks later than native maples. Japanese maple and its many forms are prime bonsai candidates. FO, GR, HG, HO, PT, SI, SN, 4, 11, 12, 18, 19, 22, 29, 33, 36, 37.
Selected Forms: **'Atropurpureum'.** Purple-leaf Japanese Maple. CB, FO, GI, GR, HH, HO, LT, NE, PT, SH, WB, WC, 1, 4, 11, 16, 17, 19, 27, 37.*
'Burgundy Lace'. Cut-leaf form with reddish-purple leaves. GR, KM, LI, PA, SP, TA, 14, 22, 29, 33, 36, 42.
'Dissectum'. Thread-leaf Japanese Maple. Slow-growing dense mound, usually broader than tall. Leaves deeply cut, almost shredded. GI, HO, OL, PT, RO, SH, SL, SP, WB, WC, WE, WF, 19, 22, 27, 33, 36.
'Koshimino'. GR, KM, RF, 14, 42.
'Okushimo'. GR, KI, KM, PA, SL, WA, 14, 36, 42.
'Ornatum' ('Dissectum Atropurpureum'). Red Thread-leaf Japanese Maple. CB, CO, DA, FO, GR, PA, SL, SP, WA, WE, WF, 8, 11, 14, 18, 22, 29, 36, 39.
'Oshio-Beni'. GR, KI, KM, LI, OL, TA, WE, 14, 22, 29, 33, 36.
'Sangokaku'. Brilliant red winter twigs. GR, HH, HO, KM, PA, TA, WA, 14, 33, 36.
'Shishigashira' (6-5B?). Exceptionally slow-growing form with very small leaves. Perhaps the best form for bonsai. GR, KI, KM, PA, SL, 42.
'Versicolor'. Green leaves variegated pink and white. GR, KM, PA, SL, WE, 36, 42.

Acer pensylvanicum (3)
Striped Maple, Moosewood
Small but vigorous shade-tolerant tree, primarily associated with cooler parts of the North. Branchlets green with white stripes. Large, slightly coarse leaves. DU, GO, GS, PA, WE, 14, 19.

†Acer platanoides (3)
Norway Maple
Broadly rounded tree to 90 ft. with large lobed leaves casting dense shade. Little autumn color. Tolerates diverse conditions but does not thrive as a street tree in New York. A prolific seeder. Many forms are more tender than the species. BO, BT, CO, GU, KE, KR, LT, PV, SH, SP, TL, WB, 1, 11, 17, 19, 27, 30, 33, 39.*
Selected Forms: **'Columnare'.** A 40-ft. tree may have a 24-ft. spread. Ascending branches. BA, CO, FE, FO, LT, MA, PV, RH, SH, WE, 1, 3, 6, 10, 11, 19, 27, 30, 33, 36.*
'Crimson King' (5). Leaves deep purple through summer. BA, CO, FE, GU, KE, KR, LT, MA, NE, PV, SH, WB, WC, 1, 11, 15, 17, 27, 29, 38.*
'Drummondii' ('Harlequin'): Leaves edged white. Foliage reversion to green is common. Handsome. CO, DA, EI, FO, GU, LC, MB, ZI, 19, 33.
'Emerald Queen'. Fast-growing, with broadly ascending branches and shiny dark green leaves. BA, CO, FE, FO, IN, KS, LC, MA, PV, RH, SH, WE, 1, 9, 10, 11, 27, 30, 33, 39.*
'Globosum'. Small globe-shaped tree more suitable than the species for planting under utility wires. BA, CO, FO, LC, PV, SH, 28, 33, 36.
'Greenlace'. Attractive cut-leaf form. FO, ML, 33.

'Schwedleri'. Leaves open purple in spring, turn deep green by early summer. Attractive because of seasonal changes. BA, FE, FO, GU, KS, LC, LT, MA, PV, RH, SH, ST, TL, 1, 6, 27, 28, 30, 33, 38.*

'Summershade'. Said to have deep green leathery foliage resistant to heat and windburn. CH, CO, EA, EI, LC, LI, SH, 1, 17, 23, 27, 33.

†Acer pseudoplatanus (5)

Sycamore Maple

Coarse, large-leaved, broad-headed tree to 60 ft. or more. Tolerates coastal conditions. Poor autumn color. A prolific seeder. CH, EI, FO, LT, WE, 11, 19, 27.

Selected Form: **'Spaethii'.** Leaves purplish-red beneath. FO, LC, WE, 11, 28, 33.

†Acer rubrum (3)

Red, Scarlet or Swamp Maple

Eventually tall-growing tree, often with rounded habit. Conspicuous in flower in early spring. Early autumn coloration is usually a good red. BA, BO, CO, GU, HA, KR, LA, LT, MA, NE, PW, SI, SN, ST, TL, WC, 1, 10, 11, 22, 27, 30, 39.*

Selected Forms: **'Armstrong'.** Very narrow growth habit. CH, EI, LI, WE, 1, 28.

'Columnare'. DA, EI, FO, SQ, 1, 11, 27, 33.

'October Glory'. With crimson autumn foliage several weeks after others have shed their leaves. EI, FO, LC, LI, LT, SH, SP, ST, WB, WE, 1, 6, 11, 17, 27, 33, 39.

Acer rufinerve (5)

Red-vein Maple

Spreading tree to about 30 ft. Attractive 3-lobed, dark green leaves turn crimson in autumn. GR.

†Acer saccharinum (dasycarpum) (3)

Silver Maple

Tall fast-growing tree with brittle branches. Handsome, deeply lobed green leaves, whitish beneath. Of little value where better trees can be grown. Primarily for cold, windy areas. Re-seeds prolifically. BA, BO, CO, FE, GU, KE, KR, LT, MA, NE, PT, PV, TL, WB, 1, 10, 11, 22, 30, 33.*

Selected Forms: **'Laciniatum' ('Wieri').** Cut-leaved, with graceful pendulous branches. FO, 19.

'Silver Queen'. Seedless. BU, GU, IN, KR, KS, LC, LI, SN, 30, 31.

†Acer saccharum (3)

Sugar Maple

Tall-growing tree with generally oval habit and rough gray bark. Autumn color variable but often brilliant orange-red. It provides the backbone of the New England autumn. There are better maples for urban conditions. BA, BO, FE, GU, HA, IN, KE, KR, LA, LT, MA, PV, PW, SH, SN, SP, TL, WC, 1, 6, 11, 12, 27, 29, 30, 39.*

Selected Forms: **'Green Mountain'.** Said to be more tolerant of windy sites because of its thick, waxy, dark green leaves. CH, CR, EA, EI, FE, FO, LC, LI, WC, WE, 1, 6, 7, 17, 27, 30, 39.

'Newton Sentry' ('Columnare') (4). Superb very narrow form. A 25-ft. tree at Brooklyn Botanic Garden is unbranched. DA, FO, LC, 11, 17, 27, 28.

'Temple's Upright' ('Monumentale') (4). Excellent narrow-growing form without a central leader. DA, EI, WE, 1, 11, 27.

Acer spicatum (2)

Mountain Maple

Shrubby small tree with often fine orange autumn color. Creamy flower spikes, which appear in early June in New England, are

Kassler Studios

The varieties of color, texture and serration in Japanese maples (*Acer palmatum*) make them suitable for almost any setting.

among the most conspicuous of any maple's. DU, HO, 14.

Acer tataricum (4)
Tatarian Maple
Small tree with bright green leaves and yellow-to-red autumn coloring. LI, PW, VA, 11.

Tree-of-heaven, Ailanthus

†Ailanthus altissima (4)
A common weed tree of American cities, suited for only the most difficult sites. FO, ML, SH, 1, 11.

Alder

Alnus cordata (5)
Italian Alder
Small to medium-sized tree with shiny heart-shaped leaves. Attractive catkins in late winter. Suited for moist sites, but where there is good drainage better trees may be selected. FO, 4, 18.

Alnus glutinosa (3)
European Alder
Rounded-headed tree of medium size. Leaves retained far into autumn. For moist sites. Several graceful cut-leaf alder forms exist, but they have been slow to come into the trade. FO, HG, LC, ML, TL, 4, 6, 22, 31.

†Alnus rhombifolia (5)
California White Alder
Rounded tree to 60 ft. or more, with dense foliage. Suited for moist locations on the West Coast. PT, 4, 18, 22, 29.

Pawpaw

Asimina triloba (5)
Small tree or occasionally a multi-stemmed shrub with drooping leaves 6-12 in. long. Of interest mainly for its 2-3-in.-long edible fruits, which led an enterprising nurseryman to call it "Michigan banana tree". It is a member of the largely tropical custard-apple family. EM, GU, LC, ML, ZI, 10, 38.

Birch

Betula albo-sinensis septentrionalis (5)
Chinese Paper Birch
Large rounded tree with splendid orange-brown peeling bark. BN, 16.

Betula allegheniensis (lutea) (3)
Yellow Birch
Tree to 60-70 ft. with broad open head and silvery yellow bark. Native to much of the Northeast and best grown in cool areas. DU, FO.

†Betula lenta (3)
Sweet Birch
Pyramidal tree to about 50 ft. Brownish-red-to-black cherry-like bark. Good yellow autumn color. DU, GS, LC.

Betula nigra (4)
River Birch
Graceful, more-or-less pyramidal tree to about 50 ft. Peeling bark, dull reddish-white to black. Grows well on moist sites. Greater heat tolerance than most birches. BA, FA, FO, GS, KR, LC, LI, MA, NE, PV, PW, WE, 1, 4, 10, 12, 19, 31, 38.

†Betula papyrifera (2)
Canoe or Paper Birch
Splendid, eventually tall-growing tree with pure white peeling bark. Usually pyramidal. Not for urban areas. BA, CO, DU, IN, KS, LT, MA, PV, PW, RH, SI, SP, VA, 11, 12, 15, 17, 27, 30, 33.*

Betula pendula (alba) (verrucosa) (3)
European White Birch
Graceful medium-sized tree with white bark and somewhat pendulous branches. Often sold in clump form. Like most other birches, it is pest-prone. Borers are a major problem. Systemic insecticides may be used to control birch-leaf miner. BO, CO, GU, HA, KS, NE, PT, SP, TL, WB, 1, 10, 11, 17, 27, 29, 30, 33, 38, 39.*
Selected Forms: **'Fastigiata'.** Strongly columnar. OL, WE, 11, 16, 27, 33.
'Gracilis' ('Laciniata'). Cut-leaf European Birch. Delicate small tree with slender weeping branches and finely dissected leaves. BU, CO, FE, IN, KE, KS, MA, PT, PV, SP, VA, WB, WC, WE, 11, 19, 27, 28, 30, 33.*
'Purple Splendor'. Purple-leaved. FO, 28, 33.
'Youngii'. Young's Weeping Birch. Asymmetrical weeping form. Should be staked while young. CO, DA, EI, LT, OL, PN, RO, SH, SQ, VA, WE, 11, 14, 16, 19, 28, 33, 36.

Betula populifolia (4)
Gray Birch
Usually a multi-stemmed small tree, common to abandoned fields in New England. The dull gray-white bark is attractive, but few old specimens are seen. Tolerant of poor, moist soil. Often infested with birch-leaf miner. DU, JA, LC, NE, RO, VI, 17, 19.

Hornbeam

†Carpinus betulus (5-4B)
European Hornbeam
Medium-sized to large spreading tree with strong, sometimes ascending branches. At-

tractive beech-like bark, but darker gray and sinewy. EI, GI, LA, LI, PW, RO, SH, TL, WE, 4, 6, 9, 11, 19, 27, 28.

Selected Form: **'Fastigiata'.** Columnar in youth; older trees become vase-shaped. CH, DA, EI, FO, GI, HG, LC, LI, LT, PW, TL, WC, WE, 1, 14, 19, 27, 28, 33, 36.

Carpinus caroliniana (3-2B)

American Hornbeam, Ironwood

Small tree, occasionally shrubby, with smooth, sinewy, bright gray bark. Good orange or red autumn color. FO, GS, HG, LC, LI, PW, SH, TL, 19, 27, 38.

Pecan, Hickory

†Carya illinoensis (pecan) (5)

Pecan

The tallest hickory, with massive branching habit and compound leaves that may be 18 or 20 in. long. While hardy northward, it is a dependable nut producer only in the South. Numerous forms exist, selected for their nuts and relative hardiness. BO, BU, BT, DA, EM, GU, KE, KR, LC, NE, SN, WB, WC, 10, 14, 38.

†Carya ovata (4-3B)

Shagbark Hickory

Very slow-growing, upright, often narrow tree to 75 ft. Noted for its loose plates of gray bark and edible nuts. Difficult to transplant. FO, KE, LC, ML, WB, 38.

Hackberry

Celtis occidentalis (4-3B)

Common Hackberry

Round-headed tree, often small because of witches'-brooms (short twiggy growths) that contribute some winter character to the outline of the tree. Blistery gray bark. BA, FE, GU, KR, KS, LC, MA, PV, PW, RH, SH, TL, WB, 1, 6, 11, 19, 27, 30, 38.*

Katsura-tree

Cercidiphyllum japonicum (4)

Frequently a spreading multi-stemmed tree growing to 45 ft. or more. Massive at maturity. Trained to a single trunk, it may form a narrow tree for some time. Fine-textured, small bluish-green leaves and yellow-to-scarlet autumn color. A variable species, some trees much more attractive than others. Avoid dry soils. DA, EI, FO, HG, LC, OL, PW, RO, SH, SI, SQ, WE, 1, 6, 11, 16, 17, 19, 22, 27.

Turkish Hazelnut

†Corylus colurna (4)

Sturdy, broadly pyramidal tree to 45 ft. or more. Fairly clean foliage that in time casts a deep shade. Catkins provide interest in late winter. Nuts, when produced, are often unnoticed, except by squirrels. HE, HG, LC, SH, 1, 6.

Persimmon

Diospyros kaki (7)

Kaki or Japanese Persimmon

Small to medium-sized tree with rounded head and lustrous dark green leaves that often have good autumn color. The ornamental orange fruit is edible, many commercial varieties having been selected over the years. While dioecious, some forms produce fruit without pollination. BO, CA, EM, PT, WB, 10.

Diospyros virginiana (5)

Common Persimmon

A horizontally branched tree that may, under excellent conditions, grow to 70 ft. or more in the South, usually much less in the North. Sometimes more-or-less shrubby. Narrow growth habit while young. Glossy dark green leaves and small, edible fruit. Mainly of use in wild-life plantings. HE, LC, LI, ML, WB, 10, 14, 38.

Russian-olive

Elaeagnus angustifolia (3)

Small spreading tree or large shrub with fine gray foliage much like that of the true olive. A useful tree for contrast, and especially attractive when planted near purple-leaved trees. Drought-resistant. Tolerant of a wide range of soil conditions. BA, BO, CO, DU, FE, GU, KE, KR, KS, LT, MA, PT, PV, WC, 1, 11, 12, 15, 27, 29, 30.*

For other **Elaeagnus,** *see page 57.*

Hardy Rubber-tree

†Eucommia ulmoides (5)

Medium-sized dioecious tree with stoutly spreading branches and lustrous elm-like foliage. The rubber content, of little economic importance, may be seen if a leaf is gently broken. Few apparent insect pests. HE, 1, 14, 28.

Beech

†Fagus grandifolia (americana) (3)

American Beech

A beautiful tall-growing tree with smooth, silvery-gray bark and shiny, leathery, coarsely serrate leaves that turn pigskin-brown after many other trees have shed their foliage in autumn. Unlike European beech it will often have root sprouts. DA, DU, EA, EI, FO, LC, LI, PW, RO, SH, WB, WE, 10, 11, 17, 19, 27.

†Fagus sylvatica (5-4B)
European Beech
Tolerant of a wider range of growing conditions than American beech, the European species has slightly deeper gray bark and smaller leaves. It is extraordinarily variable. European beech and many of its forms are among the most handsome large trees hardy in the North. DA, EI, FO, LI, PW, RO, SI, 6, 11, 14, 19, 27, 28, 33, 36.
Selected Forms: **'Asplenifolia'.** Fern-leaf Beech. One of the most attractive—and robust—trees with deeply cut foliage. It is very dense for many years and some of the secondary branches might best be pruned to provide an opening so the gray bark may be seen. CH, DA, EI, FO, GI, LI, PA, PW, RO, SH, SP, TA, WC, WF, 1, 11, 14, 19, 27, 33, 36.
'Cuprea'. Copper Beech. Young foliage has a fine, light reddish-bronze hue. Once a popular tree, but now largely superseded by Rivers purple beech. FO, SH.
'Fastigiata'. Columnar Beech. Narrow-growing form to 25 ft. or more. DA, FO, GI, RO, SH, WA, WE, WF, 8, 11, 19, 27, 36.
Var. pendula. Weeping Beech. Old specimens that have been given ample room to develop are magnificent trees. The form encountered most frequently in America is usually as broad as tall and may attain a height of 45 ft. or more. In Europe a tall, narrow-growing, pendulous form is more often seen. While an occasional old specimen may be seen on estates here, this latter form does not appear to be distinguished in the American trade. It is well suited for today's gardens. DA, EI, FO, GI, LI, LT, OL, RO, SH, SP, WE, WF, 8, 11, 14, 19, 27, 28, 33, 36.
'Purpurea Pendula'. Purple Weeping Beech. Small tree to 10 or 15 ft., height dependent on where grafted. It forms a neat dome much like Teas weeping mulberry. DA, FO, LI, PA, RO, SH, SL, TA, WC, WE, WF, 8, 14, 19, 33, 36.
'Riversii'. Rivers Purple Beech. Young foliage greenish-red but becoming purplish-black as the season progresses. CO, GI, KE, KR, LC, LT, PW, SH, SP, TL, WE, WF, 1, 6, 11, 27, 33, 36.*
'Rohanii'. Cut-leaf Purple Beech. Sizable with age. FO, GI, LI, PA, TA, WE, WF, 14, 16, 33, 36.
'Rotundifolia'. Small coin-like leaves. Less vigorous than others, but trees of 50 ft. or more are known. 14, 36, 42.
'Tricolor'. Tricolor Beech. Novelty form with pink, white and green leaf color. Less vigorous than other forms. More-or-less bushy in youth. CB, CO, DA, FO, GI, LI, OL, PA, PW, RO, TA, WC, WF, 14, 28, 33, 36.

Common Fig

Ficus carica (6)
Small shrubby tree with wide coarse leaves of tropical appearance. Evergreen southwards. Needs protected site in North. BO, CA, HA, PT, 17, 22.

Ash

†Fraxinus americana (3)
White Ash
Fast-growing, rather weedy, tall tree, often with an oval crown that is handsome at maturity. Although the wood is used for baseball bats, the brittle twigs may produce constant litter on lawns. Primarily for cold climates where better trees cannot be grown, or for situations where an immediate effect is needed. EI, FO, HG, LC, LI, MU, NE, PW, SH, WB, 1, 10, 11, 12, 14, 19, 27, 29, 38.
Selected Form: **'Rosehill'.** Seedless. CH, EI, FO, HE, HG, LC, LI, RO, WE, 22, 27, 33.

†Fraxinus excelsior (5-4B)
European Ash
Tall round-headed tree without the good yellow-purple autumn color of white ash, but somewhat more refined. LC, LI, MA, 1, 6, 23, 28, 38.
Selected Form: **'Pendula'.** Weeping European Ash. Picturesque, strongly weeping small tree. Effective in winter. FO.

Fraxinus holotricha 'Moraine' (5)
Moraine Ash
Much smaller tree—to about 35 ft.—than American ash. Vigorous. Few seeds produced. EI, 4, 33.

Fraxinus pennsylvanica (3)
Green Ash, Red Ash
Tree to about 45 ft. with rounded crown. Like white ash, fast-growing and tolerant of a wide range of conditions. Best for the Plains States. BA, CO, FO, LT, MU, NE, PV, RH, SH, SN, VA, WB, 1, 6, 11, 22, 30, 33, 39.*
Selected Form: **'Marshall's Seedless'.** BA, CO, FE, GU, KE, KS, LT, MA, NE, RH, SA, SH, WB, 1, 15, 17, 19, 22, 27, 30.*

Fraxinus quadrangulata (3)
Blue Ash
Medium-to-tall tree with narrow crown, corky 4-winged twigs and deep green leaves. FO, LC, 19.

Fraxinus velutina glabra (5)
Modesto Ash
Strong-growing but fairly small tree. Toler-

ant of dry, alkaline soils. PT, 4, 29.

For other Ash, *see page 22.*

Ginkgo, Maidenhair-tree

†Ginkgo biloba (4)

Eventually tall-growing tree with small leaves shaped like duck feet. Asymmetrical, sometimes gawky branching. Usually good yellow autumn color. Tolerant of a wide range of growing conditions. Gardeners should seek out staminate (male) forms, for the fruit on pistillate trees has a foul odor when crushed. BA, CO, GI, HA, IN, KR, LA, LT, PV, PW, SI, WB, 1, 11, 12, 17, 18, 27, 29, 38.*

Selected Forms: **'Autumn Gold'.** Good autumn color. Staminate. DA, GI, LC, LI, PT, RO, WC, 1, 4, 22, 29.

'Fastigiata'. Narrow tall-growing form with strongly ascending branches. Usually staminate. DA, EI, GI, SH, 1, 14, 22, 36.

'Pendula'. Small spreading tree with pendulous branches. Mainly for the collector. GI, PA, 36, 42.

Thornless Honey Locust

Gleditsia triacanthos inermis (4)

Rapidly-growing medium-sized tree with upright or spreading form. Rather small, refined compound leaves provide a light, airy effect. Tolerant of a wide range of growing conditions. While not pest-free, it is often planted in cities as a replacement for the American elm, although there is no resemblance. Numerous seedless or nearly seedless forms, differing slightly, exist in the trade. Best purchased in its forms.

Selected Forms: **'Imperial'.** With straight trunk. BA, CR, FO, HG, LC, LI, PV, RO, WB, 1, 7, 15, 33.

'Moraine'. Wide-spreading. DA, EI, FO, LC, LI, MB, PT, RO, SQ, WC, WE, 4, 11, 19, 22, 29, 33.

'Rubylace'. New growth red. Best seen before purchased. DA, FA, FO, GU, LC, LI, MB, ML, WC, 27.

'Shademaster'. Upright. BA, FE, KE, KR, KS, LA, LT, PV, RH, SH, WB, WC, 7, 11, 15, 27, 29, 30, 33, 39.*

'Skyline'. Pyramidal. BA, CO, DA, FO, KS, LC, LI, MA, PV, RH, RO, SA, SH, WB, WE, 1, 7, 15, 30, 33.

'Sunburst'. New foliage golden yellow. Best seen before purchased. BA, CO, GI, GU, IN, KE, KS, MA, PT, PV, SP, WB, WC, 1, 11, 17, 19, 27, 29, 30.*

Kentucky Coffee-tree

†Gymnocladus dioicus (4-3B)

Tree to 50 ft. or more, noted for its stark winter outline. The large, doubly compound leaves appear late in spring and drop early in autumn. Conspicuous leather-brown pods, produced only on pistillate trees, contain seeds once used as a coffee substitute. DU, EI, FO, KR, LC, LI, PW, RH, SH, WB, 1, 6, 10, 19, 27, 28, 30, 38.

Idesia

Idesia polycarpa (chinensis) (6)

Medium-sized tree of fairly upright habit, to 45 ft. or more. Leaves coarse, resembling a small catalpa. Usually dioecious but specimens with both sexes are known. Loose panicles of orange-red berries are briefly showy in autumn, beloved by squirrels. DU, PA.

Butternut, Walnut

†Juglans cinerea (3)

BUTTERNUT

Short-trunked, spreading, medium-sized tree with compound leaves. Grown occasionally for its nuts. BU, EM, FO, GU, HE, KE, KR, KS, MU, NE, SN, ST, VA, WE, ZI, 38.

†Juglans nigra (4-3B)

BLACK WALNUT

Tree to 60 ft. or more, similar to *J. cinerea* except for its nuts. While old trees are often picturesque, they are not good lawn trees because of their messy fruit. BO, FE, GI, KE, KR, LT, MU, SH, SN, ST, VA, WB, WE, ZI, 6, 10, 19, 30, 35, 38.*

Selected Form: **'Thomas'.** Better nuts. FE, GU, HA, HE, IN, NE, WB, WC, ZI.

†Juglans regia (6-5B)

ENGLISH OR PERSIAN WALNUT

Broad-headed tree to 60 ft. or more. Grayish bark and coarse compound leaves. Many forms exist. BO, BU, 19.

Selected Form: **Carpathian Strain (5).** Hardier than the species. BO, BU, DA, EM, FE, FO, GU, HA, HG, IN, KE, LC, NE, SH, SN, ST, WB, WC, WE, ZI.

Sweet Gum

†Liquidambar styraciflua (4)

AMERICAN SWEET GUM

Broadly pyramidal tree to 60 ft. or more with attractive lobed leaves that often turn a fine red in autumn. Gum "balls" used in winter decorations. BO, DU, GI, KR, MU, NE, PT, PW, SN, WB, WC, 1, 10, 11, 27, 29, 33, 38, 39.*

Selected Form: **'Palo Alto'.** LI, 4, 18, 22, 29.

Osage-orange

Maclura pomifera (6)

Usually a small, irregularly spreading tree with orange-brown bark. Old specimens may sometimes attain 60 ft. or more. Once a popular hedge plant because of its glossy foliage, thorny twigs and suckering habit. Curious, baseball-sized, yellow-green fruit on pistillate trees. DU.

Mulberry

Morus alba (4)

White Mulberry

Round-topped small tree with bright green leaves. Of use only on difficult sites or for wild-life plantings. Pistillate trees, bearing messy purple-to-white fruits, should not be planted near paths. Except for ailanthus, white mulberry is the most common weed tree in New York City. GU, LC, SN, 4, 19, 22.

Selected Forms: **Fruitless clones.** Useful mainly in air-polluted areas. FO, PT, 18, 28, 29.

'Chaparral'. A fruitless weeping clone. 22.

'Pendula'. Teas Weeping Mulberry. Strongly pendulous, dense, small tree, height depending on where grafted. Despite messy fruit, this once popular tree still has "architectural" merit. FO, LT, RO, SH, 11, 19, 22, 28, 29.

Var. tatarica. Russian Mulberry. Small fruits. Apparently hardier than the species. Useful wild-life tree. CO, DU, FO, LT, MA, MB, ML, WE, 11, 33, 38.

Sour Gum, Pepperidge-tree, Tupelo

†Nyssa sylvatica (4)

Fairly narrow tree to 50 ft. or more with horizontal, often slightly pendulous branches. Lustrous green leaves turn brilliant purple or scarlet in early autumn. Advisable to plant only young or frequently root-pruned specimens. DU, FO, KR, LC, NE, PA, PT, PW, RO, SH, WB, WC, 1, 10, 11, 12, 17, 19, 27, 38.*

Hop-hornbeam

†Ostrya virginiana (4-3B)

Relatively slow-growing, broadly pyramidal tree to about 45 ft. Light yellow fruits are cone-like from a distance. Fairly pest-free. BA, DU, FO, LC, LI, PV, PW, RH, SH, 1, 6, 14, 19, 27, 38.

Parrotia

Parrotia persica (5)

Shrub-like spreading tree that may after many years attain 40 ft. or more. Massive at maturity. Conspicuous mottled bark much like stewartia. Small red witch-hazel-like flowers in very early spring, often not borne in colder areas. Excellent scarlet-to-yellow autumn color. BP, DA, PA.

Amur Cork-tree

†Phellodendron amurense (4-3B)

Spreading, stoutly branched tree to 35 or 40 ft. Gray, cork-like bark and rather coarse compound leaves. Fast-growing. Old trees are imposing in winter. DU, EI, FO, GU, LC, LI, PA, PW, SH, TL, VA, WB, WC, 1, 10, 11, 19, 27, 36, 38.

Chinese Pistache

Pistacia chinensis (6?)

Broadly rounded medium-sized tree with short trunk. Refined, fairly small compound leaves turning vivid orange-red in autumn. Grown at least as far north as Philadelphia (Morris Arboretum). HO, PT, 4, 18, 22, 29.

Plane-tree, Sycamore

†Platanus acerifolia (occidentalis x orientalis) (5)

London Plane-tree

Tall, ultimately wide-spreading tree with attractive flaky outer bark. While anthracnose has diminished its utility in some areas, it is still one of the most valuable large street trees. Tolerant of an amazingly wide range of growing conditions. Incorrectly called *P. orientalis* in some catalogs. True *P. orientalis* is seldom encountered in American gardens. CO, EI, FO, HG, KE, LI, LT, PT, RO, SH, WC, 4, 10, 11, 17, 19, 27, 29, 33, 38.

Selected Form: **Bloodgood Strain.** Reportedly resistant to anthracnose. 1, 9.

†Platanus occidentalis (5-4B)

Sycamore, Button-wood

Probably the most massive—although not the tallest—deciduous tree of North America. While the upper parts of the sycamore often have more silvery bark than the London plane, it is not as adaptable in cultivation, nor is it as pest-resistant. Anthracnose is a major problem. DU, EI, FE, FO, HG, LC, NE, SH, SN, WB, 1, 4, 10, 12, 29, 30, 38.

†Platanus racemosa (7)

California Plane-tree

Tall, stoutly branched tree with picturesque growth habit and flaky bark. Often multistemmed. Pest-prone. PT, 4, 18, 22, 29.

Poplar

Populus alba (3)

White Poplar

Tall, irregularly open tree with maple-like leaves, whitish beneath. All poplars are fast-growing and weak-wooded. While often

UL, LL, LR: G. Taloumis; UR: M. Joyner; Ctr: M. M. Graff

When leaves fall in autumn, many trees reveal a second point of interest. Clockwise from upper left: canoe birch, London plane tree, Amur cork tree, yellowwood. Center: contorted hazelnut (Harry Lauder's walking stick).

attractive, they are useful mainly in the northern Plains States where growing conditions or drainage is poor. Recently, interest in them has risen because of their resistance to air pollution, but unless planted in parks, they are not good city trees. They should never be planted near sewer or water lines. FO, LC, LI, VA, 19, 23.

Selected Forms: **'Nivea'**. Silver Poplar. Leaves silvery white beneath, attractive in a breeze. SH.

'Pyramidalis' ('Bolleana'). Bolleana Poplar. Handsome narrow columnar tree to 50 ft. or more. Perhaps the best columnar poplar. BA, CO, FE, FO, GU, KS, LC, MA, PT, PV, SH, WB, 4, 10, 11, 19, 27, 33, 38.

Populus canadensis 'Eugenei' (deltoides x nigra) (4)

Carolina Poplar

Tall wide-spreading tree of rapid growth. A poor lawn tree because of constant twig fall. CO, SH, 30, 33.

†Populus maximowiczii (4)

Japanese Poplar

Tall tree, wide-spreading branches and dark green leaves, whitish beneath. LI, 19, 27.

Populus nigra 'Italica' (4-3B)

Lombardy Poplar

Graceful tall sentinel, useful for a quick screen, but short-lived. Canker-prone. BA, BT, BU, GU, KE, KR, MA, MU, NE, PT, SH, SN, WB, WC, 12, 17, 19, 27, 29, 30.*

Populus nigra 'Thevestina' (4-3B)

Theves Poplar

With the general habit of Lombardy poplar, but reported to be somewhat more pest-resistant. CO, IN, KS, ML, PV, SH, 23, 38.

Populus simonii (4-3B)

Simon or Chinese Poplar

Handsome pyramidal tree to 35 or 40 ft. Small bright green leaves. One of the most attractive species. WB.

Selected Form: **'Fastigiata'**. Narrowly columnar, although neither as columnar nor as tall as Lombardy poplar. LC, SH, 11, 27.

Populus tremuloides (1)

Quaking Aspen

Often a rather small tree with oval or rounded form. Occasionally to 90 ft. in favorable parts of its immense natural range

(Newfoundland to Alaska and northern Mexico). Handsome in a grove or near water. Bark smooth grayish-white. The attractive small leaves flutter in the slightest breeze. FO, GU, HE, KS, LC, SH, SG, VA, YB.

Plum, Choke-cherry

Prunus blireiana (cerasifera 'Atropurpurea' x mume) (5)
Blireiana Plum
Rounded tree to about 20 ft. with reddish-purple leaves. Double light pink flowers in early mid-spring. CA, DA, E1, PT, WC, 4, 18, 27, 28, 29, 33.
Selected Form: **'Newport'.** Leaves dark purple. BA, CH, EA, FO, G1, KE, KR, KS, LC, MA, PV, SQ, 1, 12, 15, 16, 19, 30, 33, 38.*

Prunus cerasifera 'Atropurpurea' (pissardii) (4)
Pissard Plum
Densely branched, upright tree to about 20 ft. Leaves reddish-purple. Single pink flowers a little before mid-spring. Small edible fruit. Many selections, differing slightly in leaf color and flowers, have been made over the years. CA, FO, 4, 13, 18, 29, 33.
Selected Forms: **'Thundercloud'.** Retains good deep purple foliage through summer. BO, BU, CA, CB, HA, KR, LT, NE, PT, SA, SP, TL, WB, WC, 1, 10, 17, 19, 27, 29, 30, 33.*
'Vesuvius'. Relatively large, very deep purple leaves. Seldom flowers. PT, 4, 18, 29, 33.

Prunus virginiana 'Shubert' (2)
Shubert Choke-cherry
Small tree with leaves first appearing green, then turning purple in late spring. Racemes of small white flowers in midspring. BA, CO, FA, FO, MA, PN, PV, RH, SH, VA, WC, 6.

For other **Prunus,** *see pp. 26, 44, 61, 73.*

Hop-tree, Wafer-ash

Ptelea trifoliata (4)
Rounded small tree or shrub with handsome foliage somewhat resembling poison-ivy. Seeds eaten by birds. DU, FO, HE, LC.

Oak

†**Quercus acutissima (6-5B)**
Saw-tooth Oak
Spreading tree with rounded crown to 45 ft. or more. Excellent foliage somewhat like that of American chestnut. Choice. FO, PW, WE, 10, 17, 19, 26, 27, 38, 39.

†**Quercus alba (4)**
White Oak
Slow-growing, eventually tall tree with stout spreading branches. Stately in old age. Leaves with rounded sinuses and lobes. Reddish-purple autumn color. Not thriving in New York City. E1, FO, LC, MU, NE, SH, SP, VA, WB, 1, 10, 17, 27, 35, 38.

†**Quercus bicolor (3)**
Swamp White Oak
Similar to the preceding species but with slightly less refined leaves. It is a species recommended for moist soils. FO, HE, LC, L1, 1.

†**Quercus rubra (borealis) (4-3B)**
Red Oak
Pyramidal, eventually tall tree. Relatively fast grower. Dark red autumn color. This and most of the other common oaks tolerate city conditions well. DU, FE, G1, GU, KE, LT, NE, PW, SH, SI, WB, 1, 6, 11, 17, 19, 22, 27, 30.*

†**Quercus coccinea (5-4B)**
Scarlet Oak
Fine round-headed tree with shiny green leaves. Superb autumn color. Rather difficult to transplant. DA, E1, FO, GU, LC, L1, MU, PW, RO, SH, WB, WE, 1, 11, 12, 17, 27, 30, 33, 38.

†**Quercus imbricaria (5)**
Shingle Oak
Broadly pyramidal tree to about 50 ft. Narrow, unlobed dark green leaves. Deep red-to-yellow autumn color. E1, FO, HG, LC, LI, MU, PW, SH, 1, 27, 31, 38.

†**Quercus laurifolia (7)**
Laurel Oak
This oak is a round-topped southern tree to 60 ft. Lustrous semi-evergreen leaves. WB.

†**Quercus macrocarpa (3)**
Burr or Mossycup Oak
Broadly rounded tree to 80 ft. or more; stout branching habit and often corky-winged twigs. Shiny dark green leaves similar to those of white oak. E1, FO, LC, LI, MU, PW, VA, 1, 22, 27, 35.

†**Quercus nigra (6)**
Water Oak
Tree to 60 ft. with conical or rounded head and slender branches. Small bluish-green leaves. FO, 10, 12, 38.

†**Quercus palustris (4)**
Pin Oak
Handsome pyramidal, eventually tall-growing tree with drooping lower branches. Deeply cut green leaves often turn a fine red in autumn, but it should be said that autumn color is variable with most such trees. BA, CO, DU, FE, KE, KR, LA, LT, NE, SI, SN, SP, TL, V1, 1, 6, 17, 22, 27, 33, 38.*
Selected Form: **'Sovereign'.** All branches

ascending. It is not columnar. EI, LI, 27.

†Quercus phellos (5)
Willow Oak
Southern tree to 50-60 ft. with deep green, willow-like leaves. Autumn color yellow. DA, DU, EA, EI, FO, ML, PW, WB, 10, 11, 12, 17, 19, 27, 33, 38.

†Quercus prinus (montana) (4)
Chestnut Oak
Tree to 50 or 60 ft. with deeply grooved bark somewhat like that of black locust. Suitable for dry, rocky soil. Shiny chestnut-like leaves become orange in autumn. FO, LC, MU, PW.

†Quercus robur (4)
English Oak
Tall tree with massive spreading branches. Picturesque at maturity. Refined small leaves. Poor autumn color. DU, EI, FO, GI, LI, PW, SH, SI, WE, 1, 14, 19, 22, 35.
Selected Form: **Var. fastigiata.** Columnar English Oak, Cypress Oak. To 40-50 ft. One of the best columnar trees. CO, DA, EI, FO, GI, HG, LC, LI, SH, TL, WE, 14, 19, 22, 27, 28, 33, 36.

†Quercus shumardii (5)
Shumard Oak
Similar to scarlet oak but with deeply cut leaves. EI, LC, LI, 1, 10, 11, 28, 33.

†Quercus velutina (5)
Black Oak
One of the tallest northern oaks. Large shiny leaves orange-red in autumn. MU.

Willow

Salix alba (2)
White Willow
Tall tree with upright branches. Golden yellow twig color is conspicuous in winter. Willows, while often very graceful, are short-lived, and their constant twig fall diminishes their usefulness as lawn specimens. The tree forms are fast-growing and in nature are usually associated with moist soils, although in the garden they may grow well with average soil drainage. None should be planted near sewer or water lines. VA.
Selected Forms: **Var. sericea.** Foliage gray-green or gray. PN.
'Tristis' ('Niobe', 'Vitellina Pendula'). Golden Niobe Weeping Willow. Stems brilliantly golden yellow in winter. Some authorities consider this a hybrid, *S. chrysocoma* (*alba* 'Vitellina' x *babylonica*). BO, FA, FE, GU, KE, KS, LT, MA, NE, PV, SH, ST, WB, 11, 15, 19, 27, 30, 33, 38.*

Salix babylonica (6)
Babylon Weeping Willow
The most intensely pendulous willow, but it lacks the good winter twig color of the preceding species. A classic tree, but often mixed up in the trade, as are other willows. DA, EA, HA, MA, MU, NE, PT, WB, 4, 10, 11, 12, 13, 17, 18, 19, 27, 29, 38, 39.

Salix blanda (babylonica x fragilis) (4)
Wisconsin Weeping Willow
Tree with graceful pendulous branches, but only half as long as those of *S. elegantissima.* Reddish-brown twig color. BO, BU, EI, EM, FE, KE, LI, WC, ZI, 10, 22, 23, 30, 33, 38.

Salix elegantissima (?babylonica x fragilis) (4-3B)
Thurlow Weeping Willow
Perhaps the most gracefully pendulous willow for the northern states. HG, WB, 27.

Salix matsudana 'Tortuosa' (5-4B)
Corkscrew Willow
Upright tree to 30 ft. or more. Branches twisted. Effective in winter, but best to see before purchasing. Twigs useful for winter decorations. BA, DA, EA, FO, GI, HG, LC, LE, MA, PV, SA, SH, WC, 10, 11, 17, 19, 38.

Salix pentandra (4)
Laurel Willow
Rounded upright tree to about 40 ft. Shiny dark green leaves. BA, FE, GU, LC, MA, PN, PV, SH, VA, 11, 27.

Salix sepulcralis (salamonii) (babylonica x alba) (5-4B)
Salamon Weeping Willow
Ultimately a sizable tree with spreading branches and loosely pendulous branchlets. GI.

For other **Salix,** *see pp. 47, 62, 75.*

Sassafras

Sassafras albidum (5-4B)
Rather narrow upright tree with green twigs and lustrous leaves that occasionally have deep sinuses. Orange-scarlet fall color. DA, DU, FO, HE, LC, LI, ML, 14, 27, 31.

Linden, Basswood

†Tilia americana (2)
Basswood, American Linden
Tall tree with oval or spreading crown. The large coarse leaves are insect-prone but, as with other lindens, the fragrant small flowers are attractive to bees. Tolerant of a wide range of growing conditions, but specimens in New York City have shown air pollution injury in recent years. BA, EI, FA, FO, KS, LC, LI, MA, PN, PV, PW, SH, WB, 1, 10, 11, 19, 27, 38.

Selected Forms: **'Fastigiata'.** KS.
'Redmond'. Densely pyramidal. BA, EI, FA, FE, FO, GU, HG, IN, LC, LI, MA, NE, PV, 1, 11, 27, 30.

†**Tilia cordata (3)**
Little-leaf Linden
Pyramidal, eventually tall tree with relatively small, heart-shaped leaves. Tolerant of diverse growing conditions and often used as a street tree. Like most lindens, an excellent shade tree. Variable. BA, FE, FO, GI, KR, LT, MA, PV, PW, RH, SP, VA, WB, 1, 10, 11, 19, 27, 30, 33.*
Selected Form: **'Greenspire'.** With straight single trunk, radially produced branches and spire-like crown. BA, CB, CO, FE, KE, KR, KS, LT, MA, PV, RH, SP, WC, 1, 6, 7, 27, 30, 33, 39.*

†**Tilia euchlora (?cordata x dasystyla) (4)**
Crimean Linden
Large spreading tree with glossy bright green leaves. FO, GI, LI, SH, WE, 1, 6, 11, 15, 19, 27, 28, 33.

†**Tilia europaea (vulgaris) (cordata x platyphyllos) (4-3B)**
Common European Linden
Large spreading tree with dark green leaves. Associated with old estates. FO, GI, WE, 19.

Tilia mongolica (4)
Mongolian Linden
Refined pyramidal tree to about 30 ft. Small deeply cut leaves very distinct from those of other lindens. GI, LI, SH, VA, 28.

†**Tilia petiolaris (5)**
Weeping Silver Linden
Beautiful large estate tree with leaves silvery-white beneath, fluttering in the slightest breeze. LC, LI.

†**Tilia platyphyllos (3)**
Big-leaf Linden
Large, rounded or pyramidal tree with rather coarse 5-in.-wide leaves. Casts dense shade.
Selected Form: **'Fastigiata'.** Narrow columnar habit. EI.

†**Tilia tomentosa (5-4B)**
Silver Linden
Stoutly branched, broadly pyramidal, tall tree with leaves conspicuously white beneath. One of the most handsome lindens, but mainly a park or estate tree. EI, FO, LC, LI, 1, 27.

Elm

†**Ulmus americana (2)**
American Elm
Beautiful tall vase-shaped tree known to everyone who has grown up in a small town in the eastern half of the continent. Not now recommended for general planting where Dutch elm disease is prevalent. DA, FO, PN, VA, WB, 11, 27.

Ulmus carpinifolia (4)
Smooth-leaved Elm
Tall tree with rounded to pyramidal habit.
Selected Form: **'Christine Buisman'.** Oval-shaped tree more-or-less resistant to Dutch elm disease. It does not have the vase-shaped habit of the American elm. Now thought to be an offspring of *U.* x *hollandica.* CR, EI, LC, WE, I, 11, 27.

Ulmus glabra 'Camperdownii' (4)
Camperdown Elm
Picturesque small tree often twice as broad as tall, with asymmetrically weeping branches. A popular old estate tree with excellent winter character, but not immune to Dutch elm disease. FO, OL, SH, 11, 16, 19, 25, 33.

Ulmus parvifolia (5)
Chinese Elm
Round-topped tree of medium size with 1-2-in.-long leaves that sometimes have good red autumn color, a unique character among elms. Some trees have fine mottled bark. Resistant to Dutch elm disease. One of the best elms for general planting. Not to be confused with *U. pumila,* which is often listed in catalogs as "Chinese elm." BO, FO, GU, IN, KE, LI, MA, MB, SN, 1, 29.
Selected Form: **Var. sempervirens (pendens).** Evergreen Elm. Evergreen only in mild climates. Drooping branches. PT, 4, 18, 22.

Ulmus pumila (3)
Siberian Elm
Fast-growing, weak-wooded tree to about 50 ft. Small fine-textured leaves. Used sometimes as a hedge in cold areas. Drought resistant. Often planted in the Midwest. Resistant to Dutch elm disease. CO, MB, PN, PT, PV, SH, VA, WB, ZI, 10, 18, 19, 23, 29, 30, 33, 38.

Zelkova

†**Zelkova serrata (5)**
Japanese Zelkova, Gray-bark or Keaki Elm
Tall, broadly round-headed tree with ascending branches. This elm relative is mechanically resistant to Dutch elm disease because of its smooth gray bark, which is plated orange-yellow on older specimens. Bonsai. DA, EI, FO, KR, LC, LT, PT, PW, RO, SI, TL, WB, WE, 4, 11, 14, 19, 27, 28, 36.
Selected Form: **'Village Green'.** Straight-trunked form said to resemble the American elm. CH, EI, LC, LI, WC, WE, 1, 17, 27.

FLOWERING TREES

Those useful as shade trees marked "†"
(See also Deciduous Trees Planted for Foliage)

Horse-Chestnut, Buckeye

Aesculus carnea (hippocastanum x pavia) (4)
Red Horse-chestnut
Round-headed tree to 60 ft. or more. Flowers in upright clusters, flesh-colored to deep red. Early May. FO, LI, RO, WE, 4, 11, 22.
Selected Form: **'Briotii'**. Flowers bright scarlet. CO, DA, HG, LI, PW, SH, WE, 8, 11, 19, 22, 27, 28, 33.

Aesculus glabra (3)
Ohio Buckeye
Round-headed tree to about 30 ft. with greenish-yellow flowers in 6-in. upright panicles in early May. Rather coarse foliage turns orange in autumn. BA, FO, GU, KR, PV, SH, VA, 6.

†Aesculus hippocastanum (3)
Common Horse-chestnut
Oval-shaped, eventually spreading tree to 60 ft. or more. Showy upright clusters of white flowers, tinged red, in early May. The leaves, susceptible to an unsightly leaf scorch in dry summers, cast a dense shade. Fruits nostalgic but messy. Mainly an estate or park tree. BA, CO, MU, SH, 10, 11, 19, 27, 33.
Selected Form: **'Baumannii' (4-3B).** Double-flowered Horse-chestnut. Similar to the preceding, but with double flowers. Does not set fruit. LI RO, SH, 28.

†Aesculus octandra (5)
Sweet Buckeye
Large spreading tree with conspicuous upright panicles of yellow flowers in midspring. Leaves turn yellow in autumn. FO, GA, GS, LC, 10, 38.

Aesculus parviflora (see p. 39.)

Aesculus pavia (5)
Red Buckeye
Small tree or shrub to 12 ft., with dainty red flowers in early-or mid-May and, for an *Aesculus,* refined foliage. FO, NE, PW, TL, 27, 38.

Silk-tree

Albizia julibrissin (7)
Tree to 25 ft. or more with open, spreading habit. Flowers light pink, resembling powder-puffs. July-August. Refined, doubly compound leaves. Very late to leaf out in spring. Often called "mimosa." Some trees offered are likely the hardier variety *rosea.* Both are valued for their relatively long flowering season, but individual trees vary in flower color and length of bloom. EA, HG, HO, NE, PT, SN, TL, WE, 4, 10, 18, 29, 33, 38.

Albizia julibrissin rosea (6-5)
Hardy Silk-tree
Similar to the preceding, but with deeper pink flowers. Hardier. Often shrubby in cold areas. BU, DA, TL, 11, 19, 22.

Shadbush, Service-berry

Amelanchier canadensis (4)
Several closely related species, including *A. arborea* (to 30-50 ft.) and the equally tall *A. laevis,* are often combined in the trade with *A. canadensis,* a more-or-less columnar shrub or small tree to 25 ft. All are shade tolerant. White flowers in mid-April in New York area are pretty but short-lived. Birds quickly eat the purple berries that ripen in June. Smooth gray bark attractive in winter. BA, CO, DU, KS, LA, LC, LT, MA, PV, PW, SH, SP, WB, WE, 6, 10, 19, 27, 32.*

Amelanchier laevis (3)
Alleghany Service-berry
Handsome small tree with spreading branches and smooth gray bark. Young leaves reddish-bronze. Flowers and fruits similar to *A. canadensis.* Of year-round interest. FO, GA, JA, LI, SH, WC, WE.

Amelanchier 'Robin Hill' (4).
Large shrub with pinkish-white flowers. WG.

Chestnut

†Castanea mollissima (5-4B)
Chinese Chestnut
Tree to about 60 ft. with dense, rounded head. Lustrous foliage. The long catkins of creamy-white flowers, while ill-scented, are handsome in late June or July. Resistant to chestnut bark disease. If grown for nuts, two or more trees should be planted. FE, GI, GU, HA, KE, KR, MU, PW, SH, SN, ST, TL, WC, WE, ZI, 10, 11, 19, 27, 33.*

Catalpa

†Catalpa speciosa (4-3B)

Tall rapid-growing tree of loosely pyramidal habit. Coarse. Conspicuous panicles of white flowers, marked yellow, in June. Large heart-shaped leaves. Bean-like pods persist into winter. Mainly a park or estate tree. BA, LT, ML, MU, PV, 4, 6, 10, 11, 19, 33, 38.

Redbud

Cercis canadensis (4)

Eastern Redbud

Tree to 25 ft. or more, with loose open habit and rather small heart-shaped leaves. Rosy purple pea-like flowers in early May. Better performance in the South and Midwest than North. CB, DU, FE, GU, KE, LT, MA, PW, SA, SH, ST, WB, WC, 1, 10, 11, 22, 27, 30, 33.*

Selected Forms: **Var. alba.** White flowers. CB, E1, FO, LC, L1, NE, WD, WE, 1, 10, 11.

'Forest Pansy'. New leaves maroon, later green. EM, HG, KR, LC, L1, WD, 10.

'Wither's Pink Charm'. Flowers soft pink. CB, 1.

Cercis chinensis (5)

Chinese Redbud

Small tree, usually shrubby, to 10 ft. or more. Rosy purple flowers in early May. More conspicuous in bloom than *C. canadensis*. EA, KE, LC, ML, RO, WC, 14, 27, 38, 39.

Fringe-tree

Chionanthus retusus (5)

Chinese Fringe-tree

Usually an upright-branched tree to about 25 ft. Although the white flowers are smaller than in the next species, they are more profuse. Early June. Choice. Available (*wholesale only*) from Gulf Stream Nursery, Wachapreague, Virginia 23480.

Chionanthus virginicus (4)

Fringe-tree, Old-Man's-Beard

Tree to about 20 ft., often shrubby and broader than tall at maturity. Drooping loose panicles of white flowers in early June. BU, CB, DA, DU, E1, FO, HG, LC, PW, RO, WC, WE, 1, 9, 10, 11, 17, 19, 27, 38.

Yellow-wood

†Cladrastis lutea (3)

Rounded tree to 40 ft. or more with smooth gray bark. Fragrant white wisteria-like flowers in late May. Ages gracefully. DA, E1, FO, LC, L1, LT, PW, RO, WB, WE, 10, 11, 19, 27, 38.

Clethra

Clethra barbinervis (5-4B)

Small tree, often multi-stemmed, with drooping racemes of fragrant white flowers in July. Outstanding cinnamon bark. Choice. HH.

Dogwood

Cornus alternifolia (3)

Pagoda Dogwood

Small tree, often shrubby, with markedly horizontal branching. Clusters of modestly attractive, small white flowers in May followed by blue-black berries in summer. Tolerant of shade. Because birds favor the fruit, most dogwoods are good for wild-life plantings. Nearly all are satisfactory in a naturalistic setting. BA, E1, FO, HE, HG, LC, MA, PV, RH, SH, 6, 15, 19.

Cornus florida (5-4B)

Flowering Dogwood

Small tree with horizontal branching. Flower bracts white, showy. Early May. Berries and autumn foliage color red. Common but choice, although not always easy to grow well because of borers and other pests. Acid soil. Shade tolerant. DU, G1, IN, KE, NE, PT, PW, SH, S1, SN, SP, TL, WB, WC, 1, 12, 16, 27, 32, 39, 40.*

Selected Forms: **'Cherokee Chief'.** Flower bracts ruby red. BO, BU, BT, CB, GO, HA, IN, KR, L1, NE, RO, SN, ST, WC, 10, 26, 33.

'Cherokee Princess'. Numerous large white flower bracts. CB, L1, 1, 26.

'Cloud 9'. White bracts. Blooms while young. CB, CR, GO, HA, KR, L1, LT, ML, ST, WC, WE, 26, 33.

'Pendula'. Stiffly weeping branches. Bracts white. KI, RO, SP, WE, 14, 33, 36, 42.

'Pluribracteata' ('Plena'). Double white flower bracts. CB, DA, HH, PA, WE, 11, 19, 36.

'Welchii'. Grown only for its foliage, colored green, white and pink. CB, DA, GR, ML, OL, PA, RO, WE, 11, 14, 16, 19, 33, 36.

Cornus florida rubra (5)

Pink Flowering Dogwood

Flower bracts vary from pink to deep red. G1, GR, HA, HH, KR, LT, NE, PT, PW, SA, SP, TL, WB, WC, 1, 11, 16, 17, 26, 27.*

Cornus kousa (5)

Japanese or Kousa Dogwood

Tree to 20 ft. or more, with spreading dense habit at maturity. White flower bracts are similar to *C. florida,* but pointed. Bracts effective for several weeks in June. Fruits strawberry-like, edible. Autumn foliage red. The mottled brown and white bark is attractive in winter. A superb tree which often performs better in New York City and points north than *C. florida*. CH, DA, EI, FO, LT, NE, OL, RO, SI, SP, WE, 10, 11, 12, 14, 16, 17, 19, 27, 31.*

Selected Forms: **'Milky Way'.** Flowers profuse. WC.

Var. sinensis. Bracts slightly longer than in the species. CB, DU, GO, KR, LI, ML, PW, SH, SK, TL, WA, WC, 9, 14, 16, 19, 36.

Other selections: 27.

Cornus mas (4-3B)

CORNELIAN-CHERRY

Small spreading tree or large shrub with clusters of tiny yellow flowers in early spring. Conspicuous red cherry-like fruit in late summer. DA, DU, FO, LC, LI, MA, PA, PW, RO, SA, SQ, WE, 1, 6, 10, 11, 15, 16, 19, 36.

Cornus nuttallii (7-6B)

PACIFIC DOGWOOD

A giant by dogwood standards—to 60 ft. or more. Growth habit fairly narrow compared with *C. florida*. Large white flower bracts, 4-6 in a group. April-flowering, but often with occasional flowers in late summer. A handsome tree, but generally not performing well in the East. LL, SG, SI, YB, 33, 37.

Selected Hybrid: **'Eddie's White Wonder'** *(nuttallii* x *florida)*. Slightly hardier than *C. nuttallii*, but flower buds will blast in a severe New York winter. 16.

Hawthorn

Crataegus arnoldiana (4-3B)

Dense rounded tree to about 20 ft. Thorny, like most in the genus. Moderately showy white flowers in late April. Orange-red fruit conspicuous in late summer before other hawthorn fruit ripens. This and most other hawthorns are good for wild-life plantings. PN, VA.

Crataegus coccinoides (5-4B)

KANSAS HAWTHORN

Densely branched round-headed tree to 15-20 ft. White flowers in early May. Fruit dark crimson. Good autumn foliage color. DU, FO.

Crataegus crus-galli (4)

COCKSPUR HAWTHORN

Fiercely armed tree to 25 ft. or more. Dense, often as broad as tall. Shiny leaves. White flowers in mid-May. Bright red fruit persists into winter. Excellent wild-life cover. BA, DU, FA, FO, LC, MA, PV, RO, SH, TL, VA, WB, 6, 11, 14, 19, 27, 31, 38.

Crataegus laevigata (oxyacantha) (4)

ENGLISH HAWTHORN

Dense round-headed tree to 15 or 20 ft. with small 3-5 lobed leaves. White flowers in mid-May. Scarlet fruit. No autumn color. This and its forms are probably the most free-flowering of all hawthorns. FO, TL, 9, 14, 19, 37.

Selected Forms: **'Autumn Glory'.** Single white flowers. Long-lasting, large red berries in autumn. Not as hardy as the species. FO, LI, PT, WC, WE, 11, 16, 19, 33.

'Paulii'. PAUL'S SCARLET HAWTHORN. Flowers double, scarlet. Few fruits. BU, CH, CO, FE, FO, KE, KS, LI, PT, SH, SP, WB, WC, WE, 11, 19, 27, 28, 30, 33.

'Plena'. Double white flowers. Few fruits. FO, 19.

'Superba'. Flowers single, bright red with star-shaped white center. Fruits red. CR, LI, ML, SP, WE, 17, 27.

Crataegus lavallei (carrieri) (crus-galli x pubescens) (4)

LAVALLE HAWTHORN

Densely branched tree to 15 or 20 ft. Numerous white flower clusters in mid-May. Scarlet fruit persists into winter. Good autumn foliage color. CR, EI, FO, HG, LC, LI, RO, SH, WE, 1, 4, 7, 11, 19, 27, 28, 33.

Crataegus monogyna 'Stricta' (4-3B)

Fastigiate tree to 20 ft. or more. Narrow habit less notable at maturity. White flowers in mid-May. Red fruits. No autumn leaf color. DA, EI, HG, WC, 19, 27, 28, 31.

Crataegus nitida (4-3B)

GLOSSY HAWTHORN

Round-headed tree to about 25 ft. Shiny leaves with orange-red autumn color. Persistent red fruits. FO.

Crataegus phaenopyrum (cordata) (4)

WASHINGTON HAWTHORN

Eventually round-headed tree to 20 ft. or more. Very thorny. White flowers in late May or early June. Scarlet-orange autumn foliage color. Small red fruit persists into winter. This hawthorn is suitable for conservation plantings. CB, DU, KE, KS, MA, PT, SH, SI, SP, TL, WB, WE, 1, 6, 7, 11, 17, 27, 31, 33.*

Crataegus pinnatifida major (5)

LARGE CHINESE HAWTHORN

Round-headed tree to about 15 ft. Lustrous dark green, deeply lobed leaves. The deep red fruits are exceptionally large for a hawthorn. 19, 28.

Crataegus 'Toba' (succulenta x laevigata 'Paulii') (3)

Tree to about 15 ft. with fragrant, double whitish flowers. Fading pink to deep rose. FO, GU, LC, LI, OL, PN, SH, VA, WE, 11, 19, 27, 33.

Crataegus viridis 'Winter King' (4)
Spreading tree, probably growing to about 25 ft. White flowers in mid-May. Profuse and persistent red fruits, borne at an early age. FO, HE, HG, LC, LI, MA, SA, 1, 15, 31.

Dove-tree

†Davidia involucrata (6-5B)
Broadly pyramidal tree to 40 ft. or more. A dogwood relative, it has two large white flower bracts of uneven size. Early or mid-May. Bracts, while striking at close range, are not long-lasting, nor are they borne at an early age. DA, GO, ML, TL, 27.

Franklinia

Franklinia (Gordonia) alatamaha (5-4B)
Upright tree to about 20 ft., often shrubby in cold areas. White, 3-in. wide, camellia-like flowers from September to frost. Autumn foliage orange-red. Good bark character. Frequently short-lived in the North, but worth growing for its year-round interest. CB, DA, EA, EI, HA, HG, OL, PW, RO, TL, WB, WC, WE, 11, 19, 22, 27, 36.

Ash

†Fraxinus ornus (5)
Flowering Ash
Round-headed tree to 40 ft. or more. Handsome 3-5 in.-long panicles of fragrant white flowers in early May. Distinctive. CB, TL, 11, 28, 29.

For other Ash *species, see page 12.*

Silver-bell

Halesia carolina (tetraptera) (monticola) (4)
Carolina Silver-bell
Vigorous tree to 30 ft. or more with spreading branches. While not showy from a distance, the white bell-like flowers have a certain charm that is lacking in many of the common flowering trees. Early May. Few pests. CB, DA, FO, GA, GS, LC, PA, SH, TL, WC, WE, 6, 10, 11, 17, 19, 27.

Castor-aralia

Kalopanax pictus (4)
Eventually a tall tree with stout spreading branches. Large ivy-like leaves. Tropical appearance. Large showy umbels of white flowers in mid-summer. Unique and stark in winter outline. LC.

Golden-rain Tree

Koelreuteria paniculata (5)
Upright tree to about 30 ft. with sinuous branching that has considerable winter interest. Refined compound leaves. Conspicuous upright clusters of yellow flowers, July or later, followed by persistent lantern-like pods. Unusually tolerant of urban conditions. Best planted in spring. BU, GI, GU, HA, KE, NE, PT, PW, SH, SN, TL, WB, WC, 1, 11, 12, 22, 27, 30, 38.*

Golden-chain Tree

Laburnum watereri (anagyroides x alpinum) (5)
Upright tree to 20 ft. or more. Flowers yellow, in wisteria-like clusters, mid-May. Handsome in bloom but of little interest the rest of the year. An application of lime on highly acid soils may be beneficial, but the tree is not notably long-lived in the eastern U.S. Most plants are probably of one cultivar, **'Vossii'**. BU, CB, FO, KE, KR, LT, PT, RO, SH, SN, SP, WB, WC, 11, 19, 27, 30, 33, 38, 39.*

Tulip-tree

†Liriodendron tulipifera (4)
One of the tallest-growing trees of the eastern American woodland, occasionally to 150 ft. In forests its trunk is straight as a telephone pole, while in gardens where the tree has ample room to develop, it has a fairly broad crown and is stoutly branched. Often called tulip-poplar, but its greenish-yellow flowers, inconspicuous from a distance, are closely related to magnolia. The cup-shaped flowers, with an orange band at the base, are exquisite. DU, FO, KR, LC, MB, MU, NE, PT, SH, TL, WB, WC, 1, 10, 11, 17, 19, 27, 29, 33.*

Maackia

Maackia amurensis (4)
Upright tree to 30 ft. or more, with smooth, yellow-brown bark. Small white pea-like flowers in panicles 4-8 in. long. July or August. LT, TL, WE, 19, 28.

Magnolia

†Magnolia acuminata (4)
Cucumber Magnolia
Tall-growing tree, ultimately developing a massive trunk and branching system. While the yellowish-green flowers in late May are not conspicuous, the red seeds that follow are attractive. DU, EI, GA, GO, GS, LC, LL, ML, PW.

Magnolia acuminata subcordata (M. cordata) (5)
Yellow Cucumber Magnolia
Upright tree to 25 ft. or more. Yellow cup-shaped flowers in mid-May, more conspicu-

ous than *M. acuminata*. Bright red seeds protrude from cucumber-like pods in autumn. CB, LL, 36.

Magnolia campbellii (8?)
Eventually a very tall, open-growing, sparsely branched tree. The fragrant pink cup-shaped flowers are among the most beautiful in the genus. Early spring. GO, LL.

Magnolia denudata (conspicua) (5)
YULAN MAGNOLIA
Tree to 35-40 ft. with spreading branches and smooth gray bark. The fragrant cream-colored flowers, up to 6-in. across, are outstanding in mid- or late April. One of the most attractive of the hardy magnolias. Some botanists consider the correct name of this species to be *M. heptapeta*. DA, FO, GO, 16.

Magnolia fraseri (5)
Tree to about 40 ft. with spreading branches. Fragrant creamy-white flowers in mid-May. LL.

Magnolia kobus (4)
KOBUS MAGNOLIA
Upright tree to 40-45 ft. Creamy-white flowers 4-5 in. across. April. DA, LC, PW, TL, 16, 19, 41.
Selected Form: **'Merrill' (4).** Vigorous upright pyramidal tree with small leaves. White flowers similar to those of star magnolia (see p. 43) but slightly larger. Ultimately to 40-50 ft. CB, CO, GO, IN, LC, OL, PW, SA, SH, TL, WC, WE, 1, 2, 6, 11, 19, 22, 33, 36.
Selected Hybrid: **'Wada's Memory' (5?).** Conspicuous large white flowers in mid-April. Blooms while young. GO.

Magnolia macrophylla (5)
BIG-LEAF MAGNOLIA
Medium-sized southern tree with coarse leaves sometimes 30-in. long. The 1-ft.-wide, fragrant, creamy-white flowers are outstanding when not marred by rain. Very distinct but difficult to use in the landscape scheme for that reason. DA, GO, LC, LL, PW, 10, 38.

Magnolia salicifolia (5)
ANISE MAGNOLIA
Pyramidal tree to 25-30 ft. Narrow leaves. Fragrant white flowers 5-in. wide. Mid-April. Blooms while young. GO, LL.

Magnolia sieboldii (parviflora) (6-5B)
OYAMA MAGNOLIA
Rounded tree to 20-25 ft., or a broad shrub, with leaves bluish beneath. Fragrant white flowers with scarlet stamens. Late May. GO, LL, 16.

Magnolia soulangiana (denudata x liliflora) (4-3B)
SAUCER MAGNOLIA
Spreading tree to about 20 ft., often multi-stemmed. Smooth grayish-white bark. Large, cup-shaped, white-to-purple flowers. The most common magnolia of northern gardens, and one of the prettiest in flower. Like most magnolias, it is tolerant of urban conditions. All are most safely planted in spring. DU, FE, GI, GU, HA, KE, LL, LT, NE, PW, SH, TL, WB, 1, 11, 12, 16, 27, 29, 30, 39.*
Selected Forms: **'Alexandrina'.** Large rose-purple flowers, white inside. FO, GO, LL, RO, 11, 22, 29, 33, 38.
'Lennei'. Dark purplish-rose flowers with occasional repeat blooms in summer. CB, FO, GO, LC, LL, NE, RO, WE, 11, 19, 33.
'Liliputian'. Rose-white flowers. Slow-growing and of smaller eventual height. GO, PA, 36.
'Rustica Rubra'. Flowers rose-red. FO, GI, HG, LC, LL, NE, PT, WB, 9, 39.

Magnolia sprengeri 'Diva' (6B)
Attractive tree to 40-50 ft. with large, bright pink flowers in early spring before the leaves appear. Slow to bloom. GO, LL.

Magnolia tripetala (4)
UMBRELLA MAGNOLIA
Small, open-headed, southern tree with 12-15-in.-long leaves and large white flowers. Fragrant. Late May. GO, GS, LL, ML, PW, 19.

Magnolia virginiana (glauca) (5)
SWEET BAY MAGNOLIA
Tree to 40 ft. or more in the South, shrub-like in the North. Fragrant white flowers over a long period in early summer. Attractive red seeds. Satisfactory in wet or well-drained soil. CB, DA, EA, EI, FO, GI, GO, HG, LI, PA, PW, WC, WE, 1, 11, 12, 17, 19, 27.

Magnolia wilsonii (6)
Small open tree, often shrubby. Fragrant white flowers with conspicuous crimson stamens. May. GO, LL.

For other **Magnolias,** *see pages 29, 43.*

Crab-apple

Malus arnoldiana (floribunda x baccata) (4-3B)
ARNOLD CRAB-APPLE
Broad dense tree to 18-20 ft. Flowers pink, fading white. Late April. Small yellow-to-red fruits. CA, EI, FO, KR, LC, LI, LT, RO, SP, WE, 6, 9, 11, 19, 27, 28, 33.

Malus atrosanguinea (halliana x sieboldii) (4)
CARMINE CRAB-APPLE

Cascading flower panicles covering the tree in July and brilliant autumn foliage make the sorrel-tree *(Oxydendrum arboreum)* a standout among the smaller ornamental trees.

George Taloumis

Rather shrubby in youth, eventually a broad-spreading tree to 15 ft. or more. Excellent character at maturity. Lustrous green foliage. Flowers crimson in bud, opening to pink. Early May. Small dark red fruits. Annual bearer. LC, LT, MA, RO, SA, SQ, WB, WE, 6, 11, 19, 27, 31, 33, 39.

†**Malus baccata (2)**
Siberian Crab-apple.
Upright tree to 40-45 ft. with fragrant white flowers in late April. Small yellow or red fruits, usually borne annually. Variable. FO, WE, 11, 27, 35.
Selected Forms: **'Columnaris'.** BA, EI, FO, KR, LI, MA, PV, SH, WE, 23, 28, 39.
Var. mandshurica. Larger flowers a week earlier. One of the first crab-apples to bloom in spring. LI, WE.

Malus coronaria 'Charlottae' (4)
Charlotte Crab-apple
Rounded tree to 15-20 ft. Attractive, large, semi-double, light pink flowers in mid- or late May after most other crab-apples have finished blooming. The large green fruit, while not abundant, may be a nuisance on lawns. Large-fruited crab-apples should not be used as street trees. Charlotte crab-apple, as a derivative of a native crab-apple, should not be grown near red-cedar (*Juniperus virginiana*) because of cedar-apple rust. Oriental species are resistant. LI, OL, WB, WE.

Malus floribunda (4-3B)
Japanese Flowering Crab-apple
Wide-spreading tree to about 30 ft. Considerable character with age. Flower buds red, opening pink, turning white. Late April. Profuse small red or yellow fruit borne annually. Most of the single-flowering crab-apples, especially ones that have an abundance of fruit annually, are good wild-life trees. CA, HA, LC, LT, MA, PT, RO, SP, WB, WE, 1, 6, 7, 10, 11, 22, 27, 30, 31, 33.*

Malus halliana 'Parkmanii' (5)
Parkman Crab-apple
Upright tree or tall shrub to 12-15 ft. Attractive rose-pink, semi-double flowers in late April. Fruits inconspicuous. EI, LI, RO, SQ, 23, 30.

Malus hupehensis (4)
Tea Crab-apple
Vase-shaped tree to 20-25 ft. Secondary branches are often just long shoots, verging between the interestingly asymmetrical and gawky. Flower buds deep pink, flowers fading to white and fragrant. Late April. Fruits small, greenish-yellow or red. CH, FO, HE, LC, LI, RO, TL, WE, 9, 11, 19, 27, 31, 36.

Malus ionensis 'Plena' (3-2B)
Bechtel Crab-apple
Round-headed tree to 20 ft. or more. Fragrant pink double flowers in mid-May. Few fruits. Avoid growing near red-cedar because of cedar-apple rust. EI, FA, KE, KR, MA, PT, SP, WE, 11, 22, 36.

Malus micromalus (4)
Kaido Crab-apple
Upright tree to 15-20 ft. Handsome bright pink flowers in late April. Fragrant. Small red fruits. More pest-prone than most. EI, FO.

Malus purpurea 'Eleyi' (pumila niedzwetskyana x atrosanguinea) (4-3B)
Eley Crab-apple
Dense tree to 20 ft. or more. Leaves purplish. Profuse, deep pink single flowers in late April. Fruits sparse. Susceptible to apple scab. BO, BT, GI, KE, LT, PT, RO, SP, WB, WE, 1, 11, 12, 27, 30, 33, 39.*

Malus purpurea 'Lemoinei' (4-3B)
Lemoine Crab-apple
Similar to the preceding, but with more deeply colored flowers. Purplish-red fruits borne annually. Resistant to apple scab. CH, EI, FO, WE, 19.

Malus sargentii
Sargent Crab-apple (see page 44.)

Malus toringoides (5-4B)
Cut-leaf Crab-apple
Densely branched upright tree to about 20 ft. White-to-pink flowers in mid-May. Pear-shaped fruit, red on the upper side, yellow beneath. Alternate bearer. HO.

Malus zumi 'Calocarpa' (baccata mandshurica x sieboldii) (5)
Zumi Crab-apple
Densely branched pyramidal tree to 20-25 ft. Flower buds pink, opening white in late April. Fragrant. Profuse small red fruits held into winter. Alternate bearer. BA, CB, DU, FO, KR, LC, LT, MA, PV, RO, SA, SP, WE, 1, 11, 27, 30, 33, 39.*

Other Crab-apples of Hybrid Origin:

Malus 'Almey' (4)
Vigorous tree to 15-20 ft. Flowers rosy-red with white center. This and the following crab-apples usually flower in early May. Bronze foliage. This crab-apple has red fruit in autumn. BO, CH, CO, FA, FO, GI, GU, KE, LI, LT, PN, SH, WB, WE, 7, 11, 19, 22, 33, 36.

Malus 'Crimson Brilliant' (4)
Rounded tree to 15-20 ft. Reddish-bronze leaves. Bright crimson flowers freely produced. One of the most conspicuous in bloom. Fruits small, purplish-red. Alternate bearer. Susceptible to apple scab. DA, LC, LI, WE.

Malus 'Dorothea' (4)
Rounded tree to 20-25 ft. Deep pink semi-double flowers. Bright yellow fruits retained into winter. CR, DA, EI, FO, LC, LI, LT, RO, WB, WE, 1, 11, 19, 23, 30, 31, 33.

Malus 'Flame' (2)
Rounded tree to 20-25 ft. Flower buds pink, flowers fading white. Abundant red fruit. Annual bearer. BA, CH, KS, MA, PV, 10.

Malus 'Hopa' (4-3B)
Tree to 20-25 ft. Greenish-bronze foliage. Flowers bright pink, freely produced. Deep red fruit, 2 inches wide, useful for jelly, but a possible nuisance on lawns. Alternate bearer. Susceptible to apple scab. BA, BO, CA, CO, FE, GI, KE, KS, LT, MA, SP, ST, WB, WE, 1, 12, 22, 27, 30, 33.*

Malus 'Katherine' (4)
Tree to 15-20 ft. Flower buds pink, flowers turning white. Profuse large double flowers. Small yellow-red fruit. Annual bearer. CB, FO, LC, LI, LT, OL, RO, WB, WC, 11, 15, 17, 19, 27, 30, 31, 33, 36.

Malus 'Liset' (4)
Tree to 20-25 ft. Reddish-bronze leaves. Profuse purplish-red flowers. Fruits dark red. CR, HE, LI, 23.

Malus 'Radiant' (4)
Upright tree to about 25 ft. Flower buds deep red, flowers deep pink. Small bright red fruit. Annual bearer. Resistant to major crab-apple pests. CB, GI, HA, IN, KE, KS, LT, MA, SA, SH, ST, VA, WB, WC, 1, 10, 11, 15, 31, 33.*

Malus 'Red Jade' (4-3B)
Tree to about 15 ft. Branches spreading, weeping. Candidate for training to special forms. Needs specimen location. Suitable for tub plantings. Flowers single, pink in bud, opening white. Very profuse small red fruit. Annual bearer, although there is slightly better fruit production in some years than others. Originated at Brooklyn Botanic Garden. CO, DA, FO, IN, KE, LA, LC, LT,

OL, RO, SA, SH, SP, WC, WE, 1, 19, 28, 31, 33.

Malus 'Vanguard' (4)
Small upright tree of dense habit. Large rose-pink flowers, single. Red fruit, 3/4 in. wide; persistent. Annual bearer. Resistant to most crab-apple pests. BA, CR, E1, FE, GU, L1, MA, PV, VA, 23, 30.

China-berry

†Melia azedarach (7)
Round-headed tree to about 40 ft. Long clusters of fragrant purplish flowers in April-May. Small yellow berries persist into winter. Useful for wild-life plantings in mild climates. 22, 29, 38.

Sourwood, Sorrel-tree

Oxydendrum arboreum (4)
Tree to about 35 ft. in the North, taller in the South. Rather narrow habit. Conspicuous drooping panicles of white flowers in July. Attractive seed pods contrast well with the brilliant autumn foliage. Acid soil. One of the most ornamental trees of the South, but hardy well into New England. DU, FO, GA, GI, HA, LT, OL, PA, PW, SI, TL, WB, WE, 11, 12, 17, 19, 22, 27, 33.*

Almond, Cherry, Peach

†Prunus avium 'Plena' (4-3B)
DOUBLE-FLOWERED MAZZARD CHERRY
Dense pyramidal tree to 45 ft. or more. Abundant double-white flowers in late April. No fruits. Useful where Japanese flowering cherries are not hardy. L1, 28.

Prunus dulcis (amygdalus) (6)
ALMOND
Densely branched tree to 20 ft. Pink or white flowers in very early spring. FE, GU, MA, MB, NE, ST, WC, 38.

Prunus 'Hally Jolivette' (5)
Very shrubby small tree, perhaps attaining 15 ft. at maturity. Diminutive leaves. Refined double-white flowers, pink in bud, in late April. Rather long bloom period. DA, L1, SA, WC, WE, 1, 6, 10, 26.

Prunus hillieri 'Spire' (incisa x sargentii) (5)
HILLIER SPIRE CHERRY
Narrow tree to 20-25 ft. Soft pink, single flowers in mid-April. Reddish autumn color. SH, 28.

Prunus maackii (2)
AMUR CHOKECHERRY
Rounded tree to 30 ft. or more. Handsome yellowish-brown, flaky bark; 2-3 in.-long racemes of white flowers in early May. BN, PN, VA, 28.

Prunus padus commutata (3)
MAY-DAY CHERRY
Small tree with rather open habit and drooping racemes of fragrant white flowers in mid- or late April. Early to leaf out. BA, BN, KR, KS, LC, PN, PV, SH, VA, 6.

Prunus pensylvanica (2)
PIN CHERRY
Short-lived but prolific small tree with attractive red bark. Racemes of small white flowers in late April. Useful for wild-life plantings in semi-naturalized land. DU, FO, VA.

Prunus persica 'Alboplena' (4)
DOUBLE WHITE-FLOWERED PEACH
Dense rounded tree to 15 ft. or more. Handsome flowers in mid-April. Fruit is usually produced on the double-flowered peaches, but it is inferior to that of named fruiting forms. Beware of borers. HA, PT, WB, WC, 38.
Other Forms: **'Roseoplena'.** Double pink flowers. PT, WB, WC, 38.
'Rubroplena'. Double red flowers. HG, NE, PT, WB, WC, 38.

†Prunus sargentii (4-3B)
Upright tree to 50 ft. or more with rounded top. Flowers deep pink, single. Mid-April. Good autumn color. E1, FO, LC, LI, LT, RO, SH, SP, TA, WE, 6, 11, 27, 28, 33.
Selected Form: **'Columnaris'.** FO, L1, WE, 28.

†Prunus serotina (3)
WILD BLACK CHERRY
A common tree in old fence rows over eastern part of North America. Useful in wild-life plantings. Drooping racemes of white flowers in mid-May. FA, FO, LC, ML, MU, 35.

Prunus serrula (5)
RED-BARK CHERRY
Spreading tree, sometimes multi-stemmed, to about 25 ft. Superb glossy red bark. White flowers, single, in late April. Worth seeking out. SP, WE, 16, 19, 27.

Prunus serrulata (5-4B)
JAPANESE FLOWERING CHERRY
Handsome tree usually growing to 20-25 ft. Of year-round interest because of growth habit, bark and flowers. Flowers, single or double, vary from white to yellow, pink and deep rose. Late April or early May. As with other *Prunus,* attention must occasionally be given to curb scale insects. The tree is best purchased in its named forms.
Selected Forms: **'Amanogawa'.** Columnar. Flowers light pink, semi-double, fragrant. DA, E1, FO, HH, L1, OL, RO, WE, 9, 11, 16, 19, 27, 28, 33, 39.

'Kiku-Shidare'. Double pink chrysanthemum-like flowers. SH.

'Kwanzan'. Vase-shaped in youth, rounded at maturity. Large, deep pink flowers, double. One of the hardiest and most satisfactory forms. BO, HA, HH, KE, KR, LA, OL, PT, RO, SA, SH, SN, SP, 16, 17, 27, 28, 30, 39.*

'Shirofugen'. Flower buds pink, opening white. Double. PT, RO, 11, 16, 19, 27, 28, 33.

'Shirotae'. Flowers, semi-double or double, white. Especially pretty. DA, 11, 19, 27, 33.

'Sieboldii'. NADEN CHERRY. Light pink flowers, double. 28.

Prunus subhirtella (5-4B)

HIGAN CHERRY

Upright or rounded tree to 30 ft. or more. Abundant small light pink flowers in mid-April. Single. SI, 19.

Selected Forms: **Var. autumnalis.** Semi-double flowers, some appearing in fall, others in spring. Modest display. RO, SP, WC, WE, 11, 16, 27, 33.

Var. pendula. Weeping. Flowers single. BU, FO, LT, NE, OL, PT, RO, SA, SN, SP, WE, 10, 11, 16, 17, 19, 27, 33, 39.*

Prunus yedoensis (probably serrulata x subhirtella) (5-4B)

YOSHINO CHERRY

Tree to 35 ft. or more. White-to-pink flowers in mid-April. The single flowered cherry of the Tidal Basin planting in Washington, D.C. DA, EI, FO, HA, PT, SN, WB, 10, 11, 12, 17, 19, 26, 27, 33.

Selected Form: **'Akebono'.** DAYBREAK CHERRY. Flowers soft pink. DA, PT, 4, 16, 19, 28, 33.

Other **Prunus,** *see pages 16, 44, 61, 73.*

Pear

†Pyrus calleryana 'Bradford' (4)

BRADFORD PEAR

Broadly pyramidal tree to 45 ft. or more. Attractive white flowers in late April. Lustrous leathery foliage, often with good red autumn color. Fruits, when produced, small, inconspicuous. Resistant to fire blight. BU, HA, IN, KE, KR, NE, OL, RO, SA, ST, TL, WB, WC, WE, 1, 10, 11, 27, 29, 31.*

Locust, Black Locust

Robinia 'Idaho' (3?)

Open-growing tree to 40 ft. Dark reddish-purple flowers in pendulous clusters. Late May. LI, 4, 22.

Robinia 'Monument' (cultivar or hybrid of R. hispida) (4)

Tree to 12-15 ft. Deep rose-pink flowers in late May. Pea-like. WC.

Robinia pseudoacacia (3)

BLACK LOCUST

Tall, often sparsely branched tree with delicate light green compound leaves. The deeply ridged bark on older specimens has much character. Fragrant white pea-like flowers in late May. Highly esteemed in Europe, but plagued by borers and leaf-miner in eastern parts of the U.S. Rather weedy, but a tree that has merit where pests are not bothersome. FO, GS, ML, MU, 10, 19, 29, 38.

Selected Forms and Hybrids: **'Descaisneana'.** Flowers pink. 29.

'Pyramidalis' ('Fastigiata'). Narrowly columnar. FO.

'Tortuosa'. Slow-growing tree with short

The Japanese dogwood *(Cornus kousa)* is at its flowering peak for several weeks in June; then come the edible red fruits in autumn.

George Taloumis

twisted branches. FO, ML.

'Umbraculifera' ('Globosa'). Small tree with densely rounded head. Seldom flowers. BA, LI, ML, PV, 28.

Scholar-tree, Pagoda-tree

†Sophora japonica (4)

Tall tree with refined compound leaves. White pea-like flowers in mid-summer. In growth habit it more closely resembles the American elm than any other tree at the Brooklyn Botanic Garden. Avoid planting near paths because of its slippery seed pods. CB, DA, E1, FO, G1, GO, L1, PW, RO, TL, WB, WC, WE, 1, 11, 19, 27, 28, 33, 38.

Selected Forms: **'Pendula'.** Picturesque weeping tree to 5-15 ft., depending on height of graft. A tight little dome. Flowers sparse. 8, 19, 28, 36.

'Regent'. Flowers earlier in life than the species. LI, 17, 27.

Mountain-ash

†Sorbus alnifolia (5-4B)

Korean Mountain-ash

Spreading medium-sized tree with smooth gray bark. Simple, somewhat alder-like leaves. Orange-scarlet fruit in autumn. Good fall color. Borer-resistant. All of the mountain-ash trees cited here have moderately conspicuous, flat white flower clusters in mid-May. The fruits of most species will attract birds. LC, L1, 27, 28.

Sorbus americana (2)

Small, often shrubby tree with showy orange-to-red berries in autumn. Leaves compound. More selection work has been done with *S. aucuparia,* which is the most widely planted species. FO, GA, MA, 14.

Sorbus aria 'Lutescens' (5)

Golden White-beam Mountain-ash

Medium-sized, broad-pyramidal tree with yellowish foliage, whitish beneath. Leaves simple. Scarlet-red berries in autumn. LI.

Sorbus aucuparia (3)

European Mountain-ash, Rowan-tree

Tree to 35-40 ft. with oval or rounded crown while young. Conspicuous white flower clusters in spring, showy orange-to-red berries in autumn. Very ornamental, but borer-prone in the East. Often short-lived. The refined compound leaves, unlike those of most European trees, have good red autumn color. CB, CO, DU, FE, GI, GU, HA, KE, LT, RH, ST, VA, WB, WC, 1, 11, 15, 27, 30, 33, 38.*

Selected Forms: **'Pendula'.** Vigorous spreading small tree with pendulous branches. GI, SH, WE, 28.

Several forms and hybrids exist with berries ranging in color from white to yellow and deep red. Available from: LI, SH, VA, 28, 30.

Sorbus decora (2)

Showy Mountain-ash

Small northern tree closely related to *S. americana,* but having larger fruit. BA, BN, PV, VA.

Sorbus tianshanica (5)

Turkestan Mountain-ash

Shrubby small tree to about 15 ft. Conspicuous white flowers and bright red fruit. Leaves compound. DU, LC, LI, WC.

Stewartia

Stewartia koreana (5)

Pyramidal tree to 35-40 ft. This and the following species are often shrubby in youth. Handsome 3-in.-wide white flowers with yellow stamens. Late June. Beautiful flaking brown-to-cream bark. Orange-red autumn color. Worth seeking out. Recently considered a cultivar of *S. pseudocamellia* and given the name 'Korean Splendor'. CB, DA, GO, PA, PW, WA, WE.

Stewartia pseudocamellia (5)

Japanese Stewartia

Pyramidal tree to 45 ft. or more. Attractive white cup-shaped flowers in late June. Purplish autumn color. Distinctive cinnamon-colored peeling bark. BP, CB, DA, DI, GO, L1, PW, RO, SH, WC, 9, 11, 16, 19, 27.

Snowbell

Styrax japonica (5)

Japanese Snowbell

Spreading small tree or tall shrub. Refined foliage. Pendulous white bell-shaped flowers in late May. Dainty. Excellent bark and trunk character. BP, CB, DA, DU, EI, GO, LA, PA, RO TL, WE, 9, 11, 16, 17, 19, 27.

Styrax obassia (5-4B)

Fragrant Snowbell

Tree to 20 ft. or more. Fragrant white flowers in late May, partly obscured by the large leaves. Smooth gray, rather sinewy bark. CB, DU, GO, PA, PW, TL, 14, 16.

Lilac

Syringa reticulata (amurensis japonica) (3)

Japanese Tree Lilac

Tree to 25-30 ft. Handsome cherry-like bark in youth. Loose upright panicles of white flowers in early June. Not fragrant. BA, CO, FA, FO, LC, LT, PN, PV, PW, RH, RO, SH, SP, WE, 1, 6, 11, 19, 27, 28.*

Other **Lilacs,** *see page 50.*

EVERGREEN TREES

Broadleaf Evergreens

Strawberry-tree

Arbutus unedo (7)
Shrubby tree to 15 or 20 ft. Shiny 4-in. long leaves. Brownish-red peeling bark. Fruits strawberry-like, effective in autumn. Requires acid soil. ML, PT, 4.
Selected Form: **'Compacta'.** Dense shrub. PT, 18, 22.

Loquat

Eriobotrya japonica (7)
Shrubby tree to 15-20 ft. Long leathery leaves, and 6-in. flower panicles in autumn. Fragrant. Edible orange-yellow fruit. May be grown as a curiosity in protected sites as far north as New York City, but it is at home only in mild climates. PT, 4, 18, 22, 29.

Eucalyptus

Eucalyptus niphophylla (7?)
Snow Gum
Tree to 25 ft. or more with narrow bluish leaves. Peeling bark. Of interest as the hardiest eucalyptus species at the University of Washington Arboretum in Seattle. 4.
Other species: PT, 4, 22.

Holly

Ilex aquifolium (6)
English Holly
Dense tree to 35 ft. or more. Often shrubby in the North. Lustrous foliage, usually spiny. Red berries borne on pistillate ("female") plants but staminate ("male") plants needed for pollination. While the tree benefits from summer sun, winter shade is advisable in the North. Very variable. English holly and its forms: CB, DA, GI, HG, HH, PT, RO, WE, 4, 5, 11, 18, 19, 22, 29, 33, 36.
Selected Form: **'Angustifolia'** (7-6B). Leaves only 1/2 in. wide. Densely pyramidal small tree in the South; a small shrub with dense foliage habit on Long Island. Bonsai candidate. EA, HH, SL, WA, 33.

Ilex latifolia (7)
Handsome evergreen tree to 50 ft. or more, with rounded crown at maturity. Large, leathery, saw-toothed foliage and clustered red berries. EA, 11, 19.

Ilex opaca (5-4B)
American Holly
Evergreen tree to 35 ft. or more, sometimes shrubby. Dull green leaves. Red berries. A systemic insecticide, applied usually once or twice in the spring according to directions, easily controls the miner that often disfigures the leaves. BU, CB, FO, GA, GI, GU, KE, RO, SP, TL, WB, WC, 5, 11, 17, 19, 26, 27, 31, 32.*
Selected Form: **'Xanthocarpa'.** Pistillate form with yellow berries. CB, DA, TL, 20.
Other named forms: DA, NE, PW, TL, WC, 31.

Southern Magnolia

Magnolia grandiflora (7)
A striking evergreen tree, eventually to 60 ft.

Roche

American holly and boxwood frame an entrance, giving year-round green accent to the red brick front.

or more. Thick lustrous leaves 5-8 in. long. Fragrant large white flowers in summer. Occasionally grown in protected sites on Long Island, but best development occurs south of Philadelphia. A variable species with many named forms. BO, CB, GO, HA, NE, PT, TL, WB, 1, 10, 12, 13, 14, 16, 17, 22, 29, 33, 38, 40.*

Selected Forms: **'Edith Bogue' (6B).** Has retained its foliage over winter in New York City in better condition than other forms. No retail source known, but your local nurseryman can order plants for you from the wholesale firm Laurelwood Gardens, 736 Pines Lake Drive West, Wayne, New Jersey 07470. Unless you are a nurseryman, please do *not* order directly from this firm.

'St. Mary'. Leaves conspicuously brown underneath. Flowers at an early age. PT, 22.

'Samuel Sommer'. Ascending branches. Large flowers. Rapid growth. GO, PT, 4, 18, 29.

Oak

Quercus ilex (7)
HOLM OAK
Broad tree to 45 ft. or more. Small leaves, unlobed and deep green in color, almost somber in effect. ML, PT, 4.

Quercus suber (7)
CORK OAK
Broad tree to 45 ft. or more. It provides the cork of commerce, but the thick and ridged bark is ornamental when the tree is grown as a landscape subject. Its leaves are small for an oak. HO, PT, 4.

Quercus virginiana (7)
SOUTHERN LIVE OAK
Tree to about 50 ft. with stout spreading branches. Massive at maturity. Refined, narrow and unlobed leaves. 4, 12, 17.

For other **oaks**, *see page 16.*

Evergreen Elm

Ulmus parvifolia sempervirens (pendens) (5)
Medium-sized, with drooping branches. Evergreen only in mild areas. See "Trees for Foliage" p. 18.

Conifers

Fir

Abies amabilis (5)
CASCADE FIR, PACIFIC SILVER FIR
Tall conical tree with shiny dark green needles. Like most firs, it grows best in regions with cool, humid weather. SI, 37.

Abies balsamea (3)
BALSAM FIR
A popular Christmas tree. The fragrant balsam fir is most successful in cooler parts of the North. FO, GI, HG, MU, PN, PV, SI, WB, 11, 19.

Abies cilicica (5)
CILICIAN FIR
Handsome tree to 60 ft. or more. Shiny deep green, comb-like needles, pointed upward and forming a V-shaped depression along the twigs. Although few specimens are in cultivation, they appear well adapted to the often dry summers of the mid-Atlantic states. KM, RF.

Abies concolor (4)
WHITE FIR
Variable, like most conifers. In the most elegant forms it is a glaucous bullet-shaped tree to 75 ft. or more. Needles 2 in. long, soft. Performs better in East than most western firs. CO, FE, FO, GI, LC, MA, MU, PV, PW, SH, SI, VA, WB, WE, 11, 19, 24, 33, 35.

Abies fraseri (4)
FRASER FIR, SOUTHERN BALSAM FIR
Much like the balsam fir, but somewhat better suited to moderate-climate gardens. Unsatisfactory on Long Island. DA, GA, MU, SI, WA, WE, 11, 19, 24, 35, 37.

Abies grandis (6)
GRAND FIR, VANCOUVER FIR
A giant among firs; in fact, one of the tallest-growing trees of North America. Shiny dark green, comb-like needles. KM, SI, 24, 33.

Abies homolepis (4)
NIKKO FIR
Attractive tree to 65 ft. or more. Shiny green needles, whitish beneath. More successful in the mid-Atlantic states than most firs. KM, LI, SI, WE, 11.

Abies koreana (5)
KOREAN FIR
A small fir to 50 ft. KM, WA, WE.

Abies lasiocarpa (2)
SUB-ALPINE FIR
Very narrowly pyramidal tree with a wide distribution in the mountains of western North America. Picturesque, but apparently needs cool, evenly moist climate to perform well. KM, SI, VA, 19, 33.

Abies lasiocarpa arizonica (6)
CORK-BARK FIR
Tree to about 45 ft. Bluish-green needles. LI, SI, WA, WE, 42.

Abies magnifica (5)
California Red Fir
Narrowly pyramidal tree to 90 ft. or more. Remarkably short and stiff horizontal branches arranged in tiers. SI, 33.
Selected Form: **Var. shastensis.** Mt. Shasta Fir. A smaller tree. RF, SI.

Abies nordmanniana (4)
Nordmann Fir
Tall tree from the Caucasus. Needles shiny green above, whitish beneath. Like most firs, most attractive while young. Does better in the heat of the mid-Atlantic states than most. CB, DA, EA, LI, PW, SI, 14.

Abies pinsapo (6)
Spanish Fir
Handsome tall tree with rigid needles, densely arranged around the branchlets and extending far down the older wood. GR.
Selected Form: **'Glauca'.** Needles blue. DA, PA, SI, SL, WA, WE, 14.

Abies procera (nobilis) (5)
Noble Fir
Tall tree native to the Pacific Northwest. Bluish-green needles. SI, 14, 33, 37.
Selected Form: **'Glauca'.** Needles blue. CB, DA, WE, 14, 36, 42.

Abies veitchii (3)
Veitch Fir
Attractive fir from Japan. Shiny dark green needles, strikingly white beneath. DA, KM, LI, WE.

Monkey-puzzle Tree

Araucaria araucana (imbricata) (7)
Oval tree to 50 ft. or more, with twisted rope-like branches. Unique—and for that reason difficult to use in the landscape. RF.

California Incense-cedar

Calocedrus (Libocedrus) decurrens (5)
Tall tree, usually narrowly columnar in cultivation. Aromatic scale-like needles somewhat resemble those of arbor-vitae. CB, PT, SG, SI, YB, 4, 18, 19, 33, 37.

Cedar

Cedrus atlantica (6)
Atlas Cedar
Tall-growing tree from the Atlas Mountains of Morocco and Algeria. Often short-trunked and spreading with age. Greenish-blue needles are clustered along the branchlets. This and its selected forms (below), especially *glauca,* are choice bonsai candidates. MU, PT, SI, TA, 4, 14, 18, 22, 29, 36.
'Argentea'. Silver Atlas Cedar. RF, SL.
'Aurea'. Golden Atlas Cedar. CB, DA, KM, SP, 42.
'Fastigiata'. Columnar Atlas Cedar. CB, DA, KI, 8, 36, 42.
Var. glauca (6-5B). Blue Atlas Cedar. Variable. CB, FO, HH, KI, OL, PA, PT, RO, WA, WE, 11, 14, 17, 18, 19, 22, 27, 29, 32, 33.*
'Glauca Pendula'. Weeping Blue Atlas Cedar. Slow-growing to about 12 ft., and broader than tall. Stake while young. CB, DA, OL, PA, SL, SP, WA, WE, 11, 14, 19, 22, 32, 33, 36.

Cedrus brevifolia (7-6B)
Cypress Cedar
Very small slow-growing tree, seldom to more than 12 ft. in cultivation. Short densely arranged needles. KI, KM, 21, 42.

Cedrus deodara (7)
Deodar Cedar
Tall spreading tree from the Himalayas. Weeping branchlets and 2-in.-long needles. Shapely in youth, superb at maturity. CB, DA, EA, PT, SI, SP, WB, 10, 12, 14, 16, 17, 18, 19, 21, 22, 29, 33, 37, 39.
Selected Form: **'Kashmir'.** Hardy to Zone 5. DI, KI, OL, WE, 14, 21, 27, 36.

Cedrus libani (6-5)
Cedar of Lebanon
The cedar of the ancients—striking in old age with flat top and horizontal branches. Var. *stenocoma* is hardier than the species, but it is not usually distinguished in the trade. CB, DA, RO, SI, WE, 14, 22, 27.
Selected Form: **'Pendula'.** Small tree with intensely pendulous branches. Stake while young. Not to be confused with **'Sargentii',** a weeping dwarf shrub (see p. 77.) CB, KI, PA, SL, 36, 42.

False-cypress

Chamaecyparis lawsoniana (6-5)
Lawson-cypress
An exceedingly variable species—some 200 forms, mostly dwarf, are known. Native to a relatively small area in northern California and southern Oregon, where it is called Port Orford cedar. More satisfactory in Europe than in many parts of the U.S. Branchlets frond-like. Foliage often bluish-green. Some trees may grow to 100 ft. or more. SG, SI, SL, YB.
Selected Forms: **'Allumii'.** Compact columnar tree with steel-blue foliage. Best while young. RF.
'Triomphe de Boskoop'. Pyramidal, to 30 ft. or more. Stiff steel-blue foliage. Named for a town in Holland noted for its many nurseries. RF, 11.

Chamaecyparis nootkatensis (4)
Nootka-cypress, Alaska-cedar
A striking conifer from the mountains of the northwestern U.S. and Canada. Ultimately tall-growing. Most trees have notably pendulous branches.
Selected Forms: **'Glauca'.** Bluish foliage. KM, WA.
'Pendula'. Differs little from the species as it is found in the higher reaches of the Cascade Mountains of Washington. However, nonpendulous forms exist, and this purported cultivar is included for those who wish to be sure of receiving a weeping Nootka-cypress. It is not a dwarf. CO, HH, KI, OL, SH, SL, WA, WE, 8, 14, 36.

Chamaecyparis obtusa (4-3B)
Hinoki-cypress
Slow-growing conifer with dark green scale-like leaves. In time a large tree. Requires acid soil. This and Sawara-cypress have few insect pests. Both, in their multitudinous forms, are used extensively in bonsai. DA, HH, PT, RO, SI, 21.
Selected Forms: **'Crippsii'.** Golden foliage. Slow-growing to about 15 ft. DA, HH, KI, SL, TL, WA, WE, 2, 14, 27, 36.
'Gracilis'. Dense slow-growing form of Hinoki-cypress. Pendulous branchlets. A small graceful tree. KI, PA, SI, SP, WA, WE, WF, 3, 11, 14, 19, 25, 32, 33, 36.

Chamaecyparis pisifera (3)
Sawara-cypress
A variable species with many garden forms, some of which are dwarf. Sawara-cypress itself may attain 75 or 100 ft. Somewhat more tolerant of soil conditions than Hinoki-cypress, but most satisfactory growth occurs in moist climates. FO, 3, 8.
Selected Forms: **'Boulevard' ('Cyanoviridis').** When well grown in a moist climate, this is a very attractive small tree with striking silvery-blue, feathery foliage. Eventually to 12 ft. or more. CO, DA, GI, KI, LA, PT, RO, SI, TL, WA, WF, 1, 2, 3, 18, 19, 21, 22, 33, 36.
'Filifera'. Thread-leaf-cypress. To 60 ft. or more, with delicate whip-like branchlets. Often wider than tall. FO, KI, LT, RO, SH, TL, WE, 11, 33, 36.
'Plumosa'. Plume-cypress. Of good tree size. Delicate frond-like branchlets. DA, FO, SI, 3, 9, 11, 19, 21.
'Squarrosa'. Moss-cypress. Small feathery silver needles. Ultimately a large tree. WF, 9.

Chamaecyparis thyoides (3)
Atlantic White-cedar
Pyramidal tree of East Coast marshlands. May grow to 75 ft., usually much less in gardens. Spire-like crown. Less attractive than other *Chamaecyparis,* but tolerant of moist soils. WE.
Selected Form: **'Glauca'.** HO, RF.

Cryptomeria

Cryptomeria japonica (6)
Tall pyramidal tree, often with short branches. Somewhat open at maturity. Young trees are shapely, old ones picturesque. A variable species, and this variability extends to hardiness. TL, 4, 14, 19, 27.
Selected Form: **'Elegans' (7-6B).** Feathery foliage distinct from the species. Small tree, often aging poorly. RF, SL.

China-fir

Cunninghamia lanceolata (7)
Striking tree with stout, shiny green needles, 2-in. long, arranged along the branchlets like the teeth of a comb. So distinct from other conifers that it is difficult to use in the landscape. Ultimately a large tree. AL, PA, 12.
Selected Form: **'Glauca'.** Blue needles. PA, RF.

Leyland-cypress

Cupressocyparis leylandii (6B)
A fast-growing bigeneric hybrid (*Cupressus macrocarpa* x *Chamaecyparis nootkatensis)* that has in recent years been widely planted in Europe, where several forms are known. Foliage resembles Nootka-cypress, but the tree is densely pyramidal. 90-ft. specimens exist in England. CB, TL, 4, 16, 18, 20, 22, 29, 36.

Cypress

Cupressus arizonica (7)
Arizona Cypress
Broadly pyramidal tree with gray or gray-green scale-like leaves. Eventually to 60 ft. or more. The attractive deep cherry-red bark of some examples suggests a closely related species, *C. glabra.* PT, SI, 4, 18, 22, 29.
Selected Forms: **'Gareei'.** Hardier than the species. KM, WA, 22.
'Pyramidalis'. 29.

Cupressus macrocarpa (7)
Monterey Cypress
A picturesque tree associated with the Monterey Peninsula of California. Satisfactory in warm coastal areas, where it is frequently used as a clipped hedge. Ultimately to 60 ft. or more. PT, YB, 4, 18.

Cupressus sempervirens var. sempervirens ('Stricta') (7)
Columnar Italian Cypress

The most narrowly fastigiate of the tall evergreens—and a characteristic tree of the Mediterranean coast. Despite its curious nomenclature, it is a cultivar. Usually sold as *C. s.* 'Stricta'. PT.

Selected Form: **'Glauca'.** PT, 4, 18, 22, 29.

Juniper

Juniperus chinensis (4)

Chinese Juniper

A very variable species, divided by some botanists into several species and hybrids. Some forms are narrow trees growing to 45 ft; others are spreading shrubs only a few feet high. Generally grayish-green to green foliage, scale-like or awl-shaped. Usually sold in its forms.

Selected Forms: **'Columnaris' ('Pyramidalis').** Narrow, to 25 ft. or more. Sharp, awl-shaped needles. DA, FO, GI, LC, RO, WE, WF, 9, 11, 22, 27, 29, 36.

'Kaizuka' ('Torulosa'). Hollywood Juniper. Broad shrubby tree to 15 ft. or more. Twisted branching is unique. Less formal than other large Chinese junipers. DA, KI, LC, OL, PT, RO, SP, WE.

'Keteleeri'. Pyramidal, to about 30 ft. Green scale-like needles and 1/2-in. wide blue berries. Often listed under *J. virginiana*. CR, EA, FO, GI, HG, LC, NE, RO, SA, SH, 3, 9, 11, 14, 15, 22, 29, 30.

'Mas'. A tall, free-flowering, densely columnar form with predominantly awl-shaped needles. The sexes are borne separately on most junipers, and this is but one of a number of staminate forms. LI.

'Mountbatten'. Narrowly columnar form with gray-green needles that are mostly awl-shaped. Dense, free-fruiting. CO, DA, GI, HG, KI, LI, MA, PV, RH, SH, WE, 14, 15, 19.

'Obelisk'. Narrowly pyramidal, probably to 12 ft. or more. KI, WE, 29.

'Robusta Green' (4). Tufted column to 15 ft. or more. Sinuous branching; less rigid than most upright Chinese junipers. Different. KI, KS, LI, RO, SP, WE, 18, 20, 22, 29, 32, 36, 40.

Juniperus communis suecica (4-3B)

Swedish Juniper

Columnar, often narrowly columnar. May ultimately grow to 40 ft., usually much lower in gardens. Dense, with nodding shoot tips. Bluish-green. It is a botanical variety and some variation occurs. EA, FO, LC.

Juniperus recurva coxii (7)

Cox Juniper

In cultivation, eventually a medium or large-sized tree with delicate weeping branches and rich green foliage. Rather open and spreading in habit. Sometimes cited as *J. coxii*. RF, SL.

Juniperus rigida (5)

Needle Juniper

A graceful small, more-or-less pyramidal tree with pendulous branchlets. Not as stiff in appearance as upright Chinese juniper forms. AL, KI, KM, SL, WA.

Juniperus scopulorum (5-4)

Western Red-cedar, Rocky Mountain Juniper

A variable species, some trees growing to 35 ft. or more. Many silvery-blue pyramidal forms, differing slightly in hardiness, have been selected in recent years by mid-western nurseries. VA.

Selected Forms: **'Blue Heaven'.** Pyramidal. Free-fruiting. CO, GI, KI, KS, PA, PT, PV, WE, 7, 14, 15, 16, 22, 29, 30, 33.

'Chandler Blue'. One of the hardiest blue pyramidal forms. WE.

'Cologreen'. Light green upright form. 22, 29.

'Gray Gleam'. Staminate form with foliage especially gray in winter. KS, SH, SL, WA, 22, 29, 33, 36.

'Pathfinder'. Pyramidal, silvery light green. KI, KS, NE, PT, WE, 4, 15, 22, 29.

'Welchii'. Silver-gray in youth. FE, GU, PV, RH, 15, 22, 29, 30.

Juniperus virginiana (3-2)

Eastern Red-cedar

Usually a medium-sized pyramidal or columnar tree in cultivation. Much variation occurs, and countless forms have been named over the years. GU, LT, MU, WE, 11, 12, 19, 22, 35.

Selected Forms: **'Burkii'.** Conical, with blue foliage. Very hardy. FO, GI, HG, LC, LI, SH, 1, 2, 3, 10, 14, 15, 25, 29, 39, 40.

'Canaertii'. Densely pyramidal, with dark green foliage. Unlike many red-cedars, good green color retained in winter. Free-fruiting. CO, DA, FO, GI, HG, LC, LI, MA, NE, WA, WE, 3, 11, 14, 15, 19, 39.

'Glauca'. Narrowly columnar, to about 20 ft. Bright blue. DA, FO, GI, HG, LC, LI, NE, 9, 10, 14, 15.

'Skyrocket'. Thin column to 10-12 ft. Much like a diminutive Italian cypress. Blue-green. CO, GI, HH, KS, OL, PA, SH, SL, WA, WE, WF, 2, 11, 14, 21, 22, 25, 26, 32, 40.

Incense-cedar

Libocedrus decurrens. *See* **Calocedrus.**

Spruce

Picea abies (excelsa) (2)

Norway Spruce

Tall tree with drooping branchlets. Attrac-

M. M. Graff

Japanese white pine *(Pinus parviflora)*, compact when young, assumes a spreading, fanciful habit at maturity.

tive while young, but seldom ages gracefully. Somber. Needs much room for proper development. Most nurseries.

Selected Forms: **'Inversa'**. DROOPING NORWAY SPRUCE. An odd, at times striking form. Narrow, intensely pendulous. Eventually to about 30 ft. DA, KI, PA, SH, SL, 14, 36.

Var. pendula. WEEPING NORWAY SPRUCE. A collective group of weeping forms. Stake this and the preceding while young. FO, GI, KI, PA, RO, SL, VA, WE, 11, 19, 21, 32, 33.

Picea breweriana (5)

BREWER OR SISKIYOU SPRUCE

Distinctive tree with weeping branchlets and gray-green needles. Needs cool moist atmosphere. Slow-growing, with few cultivated specimens over 35 ft. GR, KM, SI, SK.

Picea engelmannii (2)

ENGELMANN SPRUCE

Much like Colorado blue spruce but with soft needles. Confused in the trade with blue. EA, FO, MU, SI, 11, 24, 35, 37.

Selected Form: **'Glauca'**. LI, ML.

Picea glauca (alba, canadensis) (2)

WHITE SPRUCE

Tall tree, often with light blue-green needles. Handsome in youth. CO, EI, FE, FO, KI, LC, LI, MU, PW, RO, SH, SI, VA, 1, 19, 35.

Selected Form: **Var. densata (3).** Slower-growing and more compact. CH, CR, FE, FO, GI, LC, LI, MA, PV, RO, WB, 15, 19, 33, 35.

Picea omorika (4-3B)

SERBIAN SPRUCE

Narrowly pyramidal tree to about 75 ft. Striking at maturity. Needles dark green with bluish underside. CH, DA, EI, FO, LA, LC, LI, PA, PW, RO, SH, WE, 7, 11, 14, 19, 27.

Picea orientalis (4)

ORIENTAL SPRUCE

Graceful tall spruce from Asia Minor. Very short dark green needles. Refined. CB, DA, KI, LC, RO, SI, 11, 25, 36.

Picea pungens (3-2B)

COLORADO SPRUCE

Tall tree with green or bluish-green needles that are sharp to the touch. More adaptable to dry summers than are most spruces. Best not grown near Douglas-fir because of gall aphid association. BU, CO, HH, LA, LC, LT, MA, MU, PV, PW, RO, SH, SI, VA, WE, 1, 11, 15, 19, 27, 33, 39.*

Picea pungens glauca (3)

COLORADO BLUE SPRUCE

A well known tree, attractive for a few years, but often aging poorly. Many forms have been selected for especially blue needles.

Selected Forms: **'Glauca Pendula'**. WEEPING BLUE SPRUCE. Narrow, with intensely pendulous branches. Stake while young. CB, OL, PA, SL, SP, WE, WF, 36.

'Hoopsii'. One of the bluest of blue spruces. CO, FO, GI, HH, KI, LA, OL, PA, PN, PV, SA, SH, SL, WE, 11, 19, 25, 36.

'Koster'. Silvery. One of the best. CB, CO, FO, GI, HH, KI, LC, MA, PN, PV, PW, RO, SN, VA, 11, 15, 19, 27, 33, 39.*

'Moerheimii'. Dense, compact. Steel-blue. CB, EA, GI, HH, KI, PV, SA, SH, 11, 14, 33, 36.

Picea sitchensis (6)

SITKA SPRUCE

A splendid immense spruce of the North Pacific Coast. When the needles are seen in a certain light, they contain the shimmering beauty of an ice storm. Grows well in very sandy soil but demands a moist atmosphere. Not generally successful in the eastern U.S. ML, RF, SI.

Picea torano (polita) (5)

TIGER-TAIL SPRUCE

A tall Japanese spruce with lustrous dark green, often curved needles that are very sharp to the touch. KI, RF.

Pine

Pinus armandii (5)

Tree to 45 ft. or more, somewhat like *P. strobus,* but with slightly longer needles, more open habit at maturity and distinctly horizontal branching. RF.

Pinus banksiana (2)

JACK PINE

A rather coarse but picturesque tree with short needles arranged in pairs. Usually scrubby but occasionally to 50 ft. or more in the wild. Suitable for form-training in cold areas. Grows better on dry, gravelly slopes than most other pines. LI, WE, 6, 35.

Pinus bungeana (4)

LACE-BARK PINE

Slow-growing, eventually to 40-50 ft. Needles arranged in threes. Attractive exfoliating bark as the tree matures. Usually multistemmed. CB, DA, KI, LC, LI, OL, PA, WE, 14, 25, 27, 32, 36.

Pinus cembra (3)

SWISS STONE PINE

Slow-growing pyramidal or columnar tree, usually to not more than 30 ft. in gardens. Dark green needles arranged in fives. Habit of the Swiss stone pine is dense. CB, DA, FO, HH, KI, LT, MU, PA, PN, PW, RO, SH, SP, VA, 11, 19, 25, 27, 32, 36.*

Pinus contorta (7)

SHORE PINE

Small tree generally with dense head, but assuming many different shapes along the windswept North Pacific Coast. Short, twisted, deep green needles in pairs. KI, SG, SI, 4, 11, 21, 33, 37.

Pinus contorta latifolia (5)

LODGE-POLE PINE

Eventually a tall tree. Short, twisted needles in pairs. The most common pine of the Northern Rocky Mountains. SI, TA, VA, 24, 33, 37.

Pinus densiflora (4)

JAPANESE RED PINE

Tall, asymmetrically spreading tree with orange-brown bark. Needles in pairs. DA, GI, LI, SI, 11, 15, 21, 32, 37.

Selected Forms: **'Oculus-draconis'.** DRAGON'S EYE PINE. Needles part yellow, part green. AL, DA, GI, KI, OL, PA, SL, WA, WE, 8, 14, 21, 36.

'Umbraculifera'. TANYOSHO PINE. Densely shrubby while young, ultimately an umbrella-shaped tree to 10 ft. or more. CB, DA, FO, HH, KI, LC, LI, OL, PT, RO, SL, SP, WE, 7, 8, 16, 19, 25, 27, 33, 36.

Pinus edulis (cembroides edulis) (4)

PINYON OR NUT PINE

Slow-growing shrubby pine of the American Southwest, with needles generally in pairs. Somewhat coarse, but older specimens often have character. Of interest as one of the pines with edible seeds. GI, KS, LI, SI, SL, WE.

Pinus flexilis (2)

LIMBER PINE

Slow-growing, eventually a tall tree. Rather short needles arranged in fives. Native to much of the American West. GI, KI, LI, PW, RO, SG, SI, VA, 6.

Selected Form: **'Glauca'.** CB, KI, LC, OL, PA, WA, WE, 14, 15, 25, 32.

Pinus halepensis (7)

ALEPPO PINE

A coarse two-needle pine with broadly rounded head at maturity. Tolerant of drought, poor soil and seaside conditions in mild climates. PT, TA, 4, 18, 22, 29.

Pinus jeffreyi (5)

JEFFREY PINE

Tall-growing pine from Oregon and California. Rather long bluish-green needles arranged in fives. Closely allied to ponderosa pine. LI, SI, WE, 33, 36, 37.

Pinus koraiensis (3)

KOREAN PINE

Slow-growing, asymmetrically spreading tree with deep green needles grouped in fives. Seldom over 50 ft. in gardens. Old specimens often picturesque. KI, LC, OL, WE, 14, 42.

Pinus lambertiana (5)

SUGAR PINE

The tallest-growing of all pines, with occasional specimens in the Northwest well over 200 ft. Growth slow, often narrow. It is a five-needle pine. SI, YB.

Pinus monophylla (5)
Single-needle Pinyon Pine
Flat-topped shrubby tree, remarkable among pines for its solitary needles. KM, RF, 36.

Pinus monticola (5)
Western White Pine
Much like *P. strobus,* but more narrowly symmetrical. KM, SG, SI, VA, 37.

Pinus muricata (7)
Bishop Pine
Tree to about 30 ft., pyramidal in youth, round-headed at maturity. Native to the California coast. YB, 18.

Pinus nigra var. nigra (P. austriaca) (4)
Austrian Pine
To 75 ft. or more, with spreading branches and stiff, dark green needles in pairs. Attractive rough deep-cinnamon bark. Subject to Diplodia tip blight in Northeast. CO, FE, GI, KS, LA, LT, MA, MU, PV, PW, RH, SI, SN, 11, 15, 17, 27, 30, 33, 35.*

Pinus palustris (australis) (7)
Long-leaf Pine
Tall forest tree of the Deep South. Remarkably long (9-18 in.) needles arranged in threes. Its habit is graceful and distinct. SI, 12.

Pinus parviflora (pentaphylla) (5)
Japanese White Pine
Handsome tree with short needles grouped in fives. Generally slow-growing. Densely compact while young. Broadly spreading at maturity. Seldom over 45 ft. in gardens. Variable, but usually beautiful. Bonsai. AL, KM, SI.
Selected Form: **'Glauca'.** DA, DI, KI, LI, OL, PA, RO, WA, WE, 14, 25, 32.

Pinus peuce (4)
Macedonian Pine
Slow-growing five-needle pine. Dense. A columnar or narrowly pyramidal tree seldom over 30 ft. in gardens. KI, KM, OL, 14, 21.

Pinus pinaster (7)
Cluster Pine
Tall pyramidal tree from the Mediterranean region. Well adapted to coastal sites. Rather long bright green needles in pairs. SI, 4.

Pinus pinea (7)
Italian Stone Pine
Tall umbrella-shaped tree, characteristic of the Mediterranean countryside. Cultivated since early times for its edible seeds (called 'pine nuts'), a staple of Middle Eastern cookery. PT, 4, 18, 22, 29.

Pinus ponderosa (5)
Ponderosa or Western Yellow Pine
Tall, open and fast-growing tree, often with long needles, usually grouped in threes. Native to a large part of the American West. Plated reddish-brown bark on old trees is attractive. GI, KS, LS, LI, MU, SH, SI, VA, WE, YB, 24, 33, 35, 37.

Pinus radiata (7)
Monterey Pine
A beautiful, irregularly spreading tree at maturity, slightly resembling an old cedar of Lebanon, but with a rounded head. This pine of the California coast has bright green needles arranged in threes. PT, SG, TA, YB, 4, 21, 29.

Pinus resinosa (2)
Red or Norway Pine
Tall tree similar to Austrian pine, but having flexible needles. Best in the cooler parts of the northern U.S. and adjacent Canada, where it is native. Grows poorly in New York City. CH, CR, EA, FO, LC, LI, LT, MA, MU, PV, SI, WE, 6, 11, 19, 35.

Pinus sabiniana (6)
Digger Pine
Medium-sized tree from California with long grayish-green needles in threes. Sparse open picturesque habit at maturity. Named for the Digger Indians. One of the pines with edible seeds. 4.

Pinus strobus (3-2B)
Eastern White Pine
A beautiful, eventually tall-growing tree of eastern North America. Bluish-green or green needles in fives. Often picturesque at maturity. Highly susceptible to air pollutants, but variability extends even to this. FA, GA, GI, LA, LT, MA, MU, PW, SA, SH, SI, WE, 6, 11, 12, 27, 30, 32, 35, 39.*
Selected Forms: **'Fastigiata'.** Columnar while young. CB, DA, FO, GI, KI, OL, PA, RO, WA, WE, 8, 11, 14, 15, 27, 32, 36.
'Pendula'. Weeping, never attaining a good tree size. Stake while young. CB, GI, KI, OL, PA, RO, WA, WE, WF, 8, 14, 25, 27, 36.

Pinus sylvestris (2)
Scots Pine
A variable two-needle pine growing to about 75 ft. Slightly coarse gray-green needles. Attractive orange bark and sparse habit when fully grown. CO, FE, GI, KS, LT, MA, MU, PT, PV, RH, SI, SN, VA, 6, 10, 11, 21, 24, 29, 35.*
Selected Forms: **'Argentea'.** Needles silvery-blue. SL, VA.
'Fastigiata'. Columnar Scots Pine. AL, CB, FO, GI, KI, OL, PA, SL, VA, WA, WE, 14, 15, 33, 36.

Pinus thunbergii (5)
Japanese Black Pine
Medium-sized tree with distinctively asymmetrical habit. Dark green needles in pairs. One of the best conifers for sandy soil and seaside conditions. Bonsai. FO, GI, LT, MU, PT, SI, TL, 1, 10, 11, 12, 17, 19, 21, 27, 29, 32, 35, 39, 40.*

Pinus wallichiana (griffithii, excelsa) (6)
Himalayan Pine
Tall tree resembling eastern white pine, but with long drooping needles. Bluish-green. Striking, graceful. CB, DA, EA, GI, HH, LI, PA, SI, 14, 21, 25, 37.

Oriental Arbor-vitae

Platycladus orientalis (Thuja orientalis) (6)
Tree to 25 ft. or more, often shrubby. Fresh green scale-like foliage in vertical planes. Usually listed under its former names, *Thuja orientalis* or *Biota*.
Selected Form: **'Baker'.** 29, 40.

Podocarpus

Podocarpus macrophyllus (7)
Yew Podocarpus
Attractive, usually shrubby tree from Japan and China, eventually to 20-25 ft. Deep green 1/2-in. wide leaves. Often used as hedge in warm climates. ML, PT, 4, 18, 22, 29.
Selected Form: **Var. maki,** smaller, more refined. TA, 4, 22, 29.

Podocarpus nagi (7?)
Japanese Podocarpus, Makino
Eventually a large tree with smooth purple bark. Leaves wider and longer than in the preceding. 29.

Douglas-fir

Pseudotsuga menziesii (taxifolia, douglasii) (7-4)
A famous—and variable—timber tree of Western North America (often listed as *Abies douglasii*). Northern nurseries usually sell the hardy Rocky Mountain variety *glauca* (sometimes calling it such, more often not), which is not necessarily bluish in appearance. The attractive deep green, fast-growing Pacific Coast variety *viridis* is not reliably hardy in the Northeast. Neither should be grown near Colorado spruce (*Picea pungens*) because of gall aphid association. CO, FE, FO, GI, LC, MA, MU, PV, PW, SI, VA, WB, YB, 11, 15, 19, 27, 33, 35, 39.*
Selected Forms: **'Fastigiata'.** Conical, with strongly ascending branches. FO, KI, PA, 8, 15, 36.
'Pendula'. Drooping branches. This and the preceding are hardy forms. CB, GI, KI, OL, PA, WE, 14, 36.

Japanese Umbrella-pine

Sciadopitys verticillata (5)
Slow-growing pyramidal tree, attaining perhaps 40 ft. after many years. Remarkable for its united needles, lustrous deep green. Dense while young, usually open at maturity. CB, DA, GR, KE, KI, OL, PA, RO, SL, SP, TL, WA, WE, 2, 8, 11, 16, 19, 25, 36.

Redwood

Sequoia sempervirens (7)
The tallest-growing tree of North America, native to only the mild California coast. Not for every garden, and certainly not for the Northeast, but in mild climates with a constantly humid atmosphere, redwood can be a magnificent tree. CA, PT, YB, 4, 18, 22, 29.

Arthur N. Orans

Pines with only two or three needles in a cluster provide a coarse but often desirable texture in mixed plantings.

Giant-sequoia, Big-tree

Sequoiadendron giganteum (Sequoia gigantea) (6)

The most massive, although not the tallest tree of North America. Native to the Sierra Nevada of Eastern California. Hardier than the redwood and occasionally grown even in southern coastal New England. CA, DA, PA, PT, SG, S1, YB, 4, 18, 22, 27, 29, 33, 37.

Arbor-vitae

Thuja occidentalis (3-2)

American Arbor-vitae

Medium-sized pyramidal tree with scale-like leaves. Stiffly formal. Grows better in moist soil than most other conifers. Tolerates light shade. About 127 forms, including shrubby, globose ones, have been selected over the years. They are slightly less hardy than the species. E1, FE, FO, GI, GU, LI, MA, MB, MU, PV, SH, 14, 22, 35, 36.

Selected Forms: **'Fastigiata' ('Pyramidalis').** Useful for tall narrow hedges. BU, FE, GI, LT, MA, PT, PV, PW, SA, SH, S1, SN, WB, 1, 2, 11, 12, 15, 21, 30.*

'Nigra'. Dark green. Unlike most forms, retains good color in winter. CO, FE, FO, G1, LT, MA, OL, RO, SA, SH, WE, 2, 3, 11, 15, 17, 26, 27, 39.*

'Techny'. Very hardy, compact, dark green. FO, GU, LI, MA, MU, RH, SA, SH, WB, WE, 2, 6, 11, 15, 26, 30, 35, 36, 38.

'Wareana'. Pyramidal, dense. Bright green. Very hardy. CH, DA, E1, FE, L1, MA, RH, SH, WE, 11, 15, 36.

Thuja orientalis—*see* **Platycladus orientalis, (37).**

Thuja plicata (6-5)

Giant Arbor-vitae

Fast-growing tree with shiny bright green scale-like leaves. Massive at maturity, and often multi-stemmed. SI, 11.

Selected Form: **'Atrovirens'.** 9.

Thuja standishii (5)

Japanese Arbor-vitae

Small to medium-sized tree. Often multi-stemmed. Spreading branches. AL.

William Eng

Hiba Arbor-vitae

Thujopsis dolabrata (6)

Small to medium-sized Japanese tree, sometimes shrubby. Similar to arbor-vitae, but with broader, very flattened branchlets and larger, shiny leaves, silvery beneath. GR, KI.

Hemlock

Tsuga canadensis (4-3B)

Common Hemlock

Graceful shade-tolerant tree to 50 ft. or more. Attractive short needles. May be used for dense clipped hedges. This is not a tree for windy sites. CO, FO, GA, GI, LT, MA, PV, PW, SA, SI, TL, WB, 1, 6, 10, 11, 16, 17, 27, 32, 39.*

Selected Forms: **'Atrovirens'.** Dark green. K1, KM, 36.

Var. pendula (sargentii). Sargent Weeping Hemlock. Eventually to 10 ft. or more, often three times as wide. One of the finest weeping trees. AL, CB, FO, GI, GR, HH, K1, LA, PA, RA, SL, SP, WF, 11, 19, 27, 32, 33, 36, 39.*

Tsuga caroliniana (4)

Carolina Hemlock

Slower-growing in youth than common hemlock, but often more dense at maturity. It will grow eventually to about 50 ft. DA, GA, LA, LC, LT, PW, RO, WE, 11, 14, 19, 21, 27, 36.

Tsuga diversifolia (5)

Japanese Hemlock

Usually only a small tree in America. Spreading branches. Often multi-stemmed. CB, DA, PA, SL, WE, 11, 21.

Tsuga heterophylla (5)

Western Hemlock

The tallest and perhaps most attractive hemlock, but it requires a humid atmosphere. Not for the Northeast. KM, S1, SL, 33.

Tsuga mertensiana (6)

Mountain Hemlock

Distinctive hemlock native to higher elevations from Alaska to California. Slender, pendant branches and radially spreading needles. Although it may grow to 90 ft. or more in the Northwest, it is only a slow-growing shrub in the Northeast. PA, S1, WE.

Tsuga sieboldii (5)

Siebold Hemlock

Similar to *T. diversifolia*. Yellowish-brown glabrous branchlets (reddish-brown hairy branchlets in *T. diversifolia*). DA, KM, OL, 11.

FLOWERING SHRUBS

Broadleaf-evergreen and Deciduous

Note: The shrubs in this section are deciduous unless otherwise described.

Bottle-brush Buckeye

Aesculus parviflora (4)

Suckering shrub to 6-8 ft., two or three times as broad as tall. Conspicuous pyramidal clusters of white flowers in early summer when few other shrubs are in bloom. Shade-tolerant, but best flower development occurs in full sun. FO, HG, SH, WE.

For other **Aesculus** *see page 19.*

Butterfly-bush

Buddleia alternifolia (5-4B)

Fountain Butterfly-bush

Spreading shrub to 8-10 ft. Long spikes of purplish-lilac flowers in early June. Conspicuous in bloom, but requires periodic pruning to alter a poor growth habit. Prune after flowering. LE, SH, WC, 41.

Buddleia davidii (5-4B)

Orange-eye Butterfly-bush

Coarse lanky shrub to 8 ft. or more. Valued only for its prolific foot-long flower spikes, ranging in color from white to red and purple, produced in summer when few other shrubs are in bloom. In the North it is best cut back nearly to the ground in late winter. Wood more-or-less hardy on Long Island.

Selected Forms: **'Charming'**. Pink flowers. BU, CO, EI, FE, IN, KE, SQ, WB, 22, 23, 30.

'Dubonnet'. Flowers deep purple. BU, KE, KS, RO, WE, 22, 23, 30.

'Empire Blue'. Deep blue. CO, FE, IN, KS, MB, SQ, WC, 23, 30.

'Fascinating'. Flowers soft Cattleya-pink. CO, LE, SH, WC.

'Ile de France'. Lilac-purple. BU, CO, EI, KE, RO, WB, 23, 30, 38.

'Peace'. White. EI, SH, 30.

'Royal Red'. Reddish-purple. CO, FE, HG, IN, KS, MB, SQ, WE, 23, 30.

Carolina Allspice, Sweet-shrub

Calycanthus floridus (5-4B)

Dense mound to 5 ft. or more. Highly scented, dark reddish-brown flowers in early May. Much of the material in the trade may be a related species or hybrid having little scent, except in the foliage. Best to purchase locally at time of flowering so that fragrance may be verified.

Camellia

Camellia japonica and forms (7)

Common Camellia

Handsome evergreen shrub to 25 ft. or more, much lower toward its northern limit of hardiness. Beautiful white, pink, rose, or red flowers, single or double. Winter to spring flowering. An important mild-climate shrub, but hardiness varies, and plants can be grown in protected sites as far north as Long Island. Little difference in hardiness between this and the following species has been observed at the Brooklyn Botanic Garden. Many, many named forms. CB, DA, HA, NU, PT, I, 12, 17, 18, 22, 29, 33, 40.

Camellia sasanqua and forms (7)

Sasanqua Camellia

Similar to the preceding, but with smaller evergreen leaves. Autumn-flowering. HA, NU, PT, 1, 12, 13, 16, 17, 18, 22, 29, 33, 36, 40.

Ceanothus

Ceanothus species and hybrids

A substantial group of evergreen or deciduous shrubs of varied height, mostly native to the West Coast and not often thriving in the East, especially northwards. Leaves frequently small, lustrous and refined. White, blue or purple flower clusters superficially resemble syringa, hence a common name for some kinds—California-lilac. PT, SK, YB, 18, 29.

Button-bush

Cephalanthus occidentalis (4)

Eventually a tall shrub with coarse foliage. Creamy-white ball-shaped clusters of flowers in mid-summer. Suited mainly for wet sites. FO.

Flowering Quince

Chaenomeles speciosa (lagenaria) and related hybrids (4)

Shrubs 3-6 ft. with showy flowers ranging in color from red to pink and white (and orange in hybrid form). Flowers over a fairly long period in late April and early May. There are many named forms, and it is perhaps best to choose flower color at a local nursery or garden center. Available from most mail-order firms. Wider selection than most: CR, FO, LC, LI, LL, SA, SI, WC, WE, 9, 15, 17, 19, 22, 29.

Wintersweet

Chimonanthus (Meratia) praecox (7)
WINTERSWEET
Shrub to 6-8 ft. with intensely fragrant yellowish flowers in late winter. Of borderline hardiness in New York City. 16.

Mexican-orange

Choisya ternata (7-6B)
Open-growing shrub to 7-8 ft. with 3-in.-long aromatic leaves. Fragrant white flowers in late spring. PT, 33.

Harlequin Glory-bower

Clerodendrum trichotomum (6)
Vigorous coarse-leaved shrub to about 6 ft. in the North, attaining small-tree dimensions in the South. Valued for its fragrant white flowers in August and subsequent blue berries. The berry is attractive in the foreground of a persistent red calyx. PA.

Sweet Pepper-bush

Clethra alnifolia (4-3B)
Lanky shrub to 7-8 ft. with upright spikes of strongly fragrant white flowers in summer. Decorative seed pods. Good for somewhat moist soils. Shade-tolerant. CB, EI, FO, GA, LI, LT, SP, SQ, VI, WE, 1, 9, 11, 19, 27, 32.
Named Form: **'Rosea'.** Flower buds pink. Flowers usually changing to white. CB, CH, DA, KE, LI, RO, WC, WE, 1, 2, 11, 19, 27.

Cotoneaster

Cotoneaster multiflorus and var. calocarpus (4)
Graceful shrub to 8 ft. with arching branches and light red or pink berries. The white flowers are only 1/2 in. across but freely produced. LI, MA, VA, 6.
For other **Cotoneaster** *see pages 56, 67.*

Broom

Cytisus 'Hollandia' (5)
To 6 ft. Purple-red flowers in May. CB, KI, OL, RO, 32, 33.

Cytisus praecox (multiflorus x purgans) (5)
WARMINSTER BROOM
Shrub to 4 ft. or more. Sulfur-yellow pea-like flowers along arched, slender green stems. Early May. This and other brooms need well-drained soil and perform well in predominantly sandy soil. CB, CR, HH, KS, OL, RO, SP, WC, WE, WF, 11, 16, 19, 27, 32, 33.

Cytisus scoparius (5-4B)
SCOTCH BROOM
Shrub to 6 ft. with fairly large, bright yellow flowers a bit later than *C. praecox*. CB, DA, GA, 9, 10, 12, 16, 22, 32, 38.

Dwarf Cytisus: *See page 68.*

Deutzia

Deutzia gracilis (5-4B)
SLENDER DEUTZIA
Mound-like shrub to 3-4 ft. Upright racemes of white flowers in mid-May. CO, FE, FO, GI, KE, LA, MA, NE, SP, WB, WC, 1, 2, 11, 15, 17, 22, 27, 30.*

Deutzia lemoinei (gracilis x parviflora) (4)
To 6 ft. Many small white flowers in mid-May. BA, FO, MA, PV, WC, 9, 11, 30, 39, 41.

Deutzia rosea (gracilis x purpurascens) (5-4B)
Compact shrub to 4-5 ft. with bell-shaped flowers, pink outside. Mid-May. BU, CB, DA, RO, WB, 19, 39.

Deutzia scabra 'Pride of Rochester' (4)
Erect shrub to 7-8 ft; 4-1/2 in.-long spikes of double white flowers a bit later than most deutzias. Flowers with a slight tinge of pink. EI, EM, WB, 10, 11, 17, 19, 30, 38.

Red-vein Enkianthus

Enkianthus campanulatus (4)
Tall upright shrub with refined foliage. Dainty yellow bell-shaped flowers with red veins. Early May. Leaves turn brilliant scarlet or yellow in autumn. Acid soil. CB, CR, DA, EI, FO, LC, LT, OL, PW, RO, SP, WE, 9, 11, 16, 19, 27.
Other **Enkianthus,** *page 69.*

Pearl-bush

Exochorda macrantha 'The Bride' (racemosa x korolkowii) (5-4B)
Mounded shrub to about 4 ft. Conspicuous 2-in.-wide white flowers in late April. Handsome. WC, 41.

Exochorda racemosa (grandiflora) (4)
Slender spreading shrub to about 8 ft. tall. Hardier than the preceding plant, but with slightly smaller flowers. FO, HH, JA, SH, 11, 19.

Forsythia

Forsythia intermedia (suspensa x viridissima) (5)
Upright shrub to 7-8 ft. with long, spreading

J. Horace McFarland

After the red-veined yellow flowers fade the seed pods of *Enkianthus campanulatus* turn upward and resemble miniature carriage lights against the brilliant autumn foliage.

branches. Showy yellow flowers in early April.

Selected Forms: **Farrand Hybrids ('Beatrix Farrand').** Vivid yellow flowers often 2-in. wide. CH, CO, FA, FO, GO, KE, KS, LC, LI, MA, SH, TL, WB, WC, 2, 33, 38.

'Karl Sax'. Similar to the preceding but apparently hardier in bud. CH, FO, GU, HG, IN, KR, LE, RH, SH, ST, WE, 2, 6, 11, 15.

'Lynwood' ('Lynwood Gold'). Golden yellow. BU, CB, CO, FE, GI, KE, MA, MU, SA, SN, TL, WB, WC, 1, 2, 10, 11, 30, 32, 33.*

'Spectabilis'. Deep yellow. BO, FO, KE, RO, SH, SN, SP, SQ, WE, 1, 10, 11, 19, 27, 30, 39.*

'Spring Glory'. Pale yellow. CB, FO, HA, KE, LC, LE, LT, MA, SA, SN, WB, WC, 2, 11, 12, 17, 22, 30, 33, 38.*

Forsythia ovata (4)

EARLY FORSYTHIA

Spreading shrub to about 4 ft. tall. Pale yellow flowers about a week before other forsythia. Not as showy as *intermedia* forms, but hardier. BN, LC, MA, SH, 30, 41.

Selected Form: **'Tetragold'.** Large bright yellow flowers. Slightly less vigorous than others of its kind. WE.

Forsythia suspensa 'Fortunei' (4)

Robust shrub to 6-7 ft. with long erect, finally spreading stems. Flowers bright yellow. MA, 33.

Forsythia suspensa 'Sieboldii' (4)

SIEBOLD WEEPING FORSYTHIA

Slender, trailing stems characterize this form. Most effective when allowed to droop over a wall. Much of what is sold simply as *F. suspensa* is likely this form. WE, 2, 30, 41.

For other **Forsythia** *see page 70.*

Fothergilla

Fothergilla gardenii (5)

Compact grower to 3 ft., a diminutive version of the following species. WA.

Fothergilla major (monticola) (5-4B)

Slow-growing upright shrub to 6-7 ft. White flower spikes in early May resemble small bottle brushes. Foliage, which often turns fine scarlet in autumn, is similar to witch-hazel but more refined. Choice. BP, DA, EI, FO, KI, LI, SH, WE, 11, 16, 27.

Witch-hazel

Hamamelis intermedia 'Arnold Promise' (mollis x japonica) (4)

Large shrub, broader than tall at maturity, with numerous yellow flowers in late winter. CB, TL, WE, 1, 8, 11, 27.

Hamamelis mollis (5-4B)

CHINESE WITCH-HAZEL

Tall open-growing shrub valued in moderate climates for its spidery golden-yellow fragrant flowers in mid-winter. In cold areas it flowers in early spring. In New York City it usually starts to bloom in late January, the flowers continuing into March. FO, GI, GO, KI, ML, PA, RO, WC, 11, 16, 27.

Selected Form: **'Brevipetala'.** Flowers showier than in the species. GI, WE, 42.

Hamamelis vernalis (5)
SPRING WITCH-HAZEL
Dense shrub to 5 ft. or more. Fragrant tiny yellow flowers appear from December to April, depending on climate. In New York City it usually flowers in a mild January. CH, EI, FO, GO, LC, LI, RO, SA, TL, WC, ZI, 1, 11, 15, 27.

Hamamelis virginiana (4-3B)
COMMON WITCH-HAZEL
Tall shrub with spidery yellow flowers in autumn. More conspicuous than *H. vernalis* but less showy than *H. mollis*. Most *Hamamelis* have good yellow autumn color. DU, FO, GA, GI, LC, MA, SH, TL, 1, 11, 12, 15, 27, 30, 38.

Rose-of-Sharon

Hibiscus syriacus (5)
Stiffly branched tall shrub or small tree. Valued mainly for its mallow-like flowers in summer. Late to leaf out. Try to buy young specimens in spring. Unusually tolerant of urban conditions. Because of the varied flower color, it is wise to purchase named forms. The following have single flowers 3-3-1/2 in. across:

'Bluebird'. Flowers blue, with a slight lavender tinge. BU, CB, FE, HA, IN, KE, RO, WC, WE, 10.

'Hamabo'. Peppermint. WC.

'Red Heart'. White, with red center. WC, WE, 22.

'William R. Smith'. Completely white. RO, WE.

'Woodbridge'. Purplish-red. RO, WC, 22.

(**Note:** the somewhat less attractive double-flowering forms of rose-of-Sharon may be obtained from most nurseries.)

Hydrangea

Hydrangea arborescens 'Grandiflora' (4)
HILLS-OF-SNOW
Rounded bush to 3-4 ft. Slightly flattened snowballs of white flowers, beginning in July. BA, CH, CO, DA, EI, FA, GU, KE, KS, LC, LI, MA, PV, SH, ST, WE, 11, 23, 27, 30.

Other Form: **'Annabelle'.** Flower clusters larger. BA, CB, CO, EM, FA, IN, KE, KR, KS, MA, NE, PV, RH, SN, WC, 1, 2, 6, 23, 30.*

Hydrangea macrophylla (6-5B)
HOUSE HYDRANGEA, HORTENSIA
Rounded shrub to 3-4 ft. in the North, taller in the South. Flowers blue in acid soil, pink in alkaline soil. Rounded flower clusters, 5-10 in. or more in diameter. Summer-blooming, especially good in coastal areas. Many named forms. KE, LC, RO, WC, 22, 32.

Two hardier forms are of note: **'Domotoi' (4).** DA, ST, WC, 23.

'Nikko Blue' (4). CB, CO, CR, EI, EM, HA, IN, KR, LT, NE, SN, SP, WB, WE, 10, 11, 19, 30, 32, 38.

Hydrangea paniculata ('Praecox', 'Tardiva') (4-3B)
PANICLE HYDRANGEA
Tall summer-flowering shrub with 8-10-in., pyramidal clusters of partly sterile, partly fertile flowers. FO, LA, LI.

Hydrangea paniculata 'Grandiflora' (4-3B)
PEEGEE HYDRANGEA
Similar to the preceding, but the more conspicuous flower clusters, nearly all sterile, appear in August. Very common and showy but coarse. BA, CB, FE, GA, GI, GU, KE, KR, KS, LT, PV, SH, SN, WC, 11, 12, 15, 27, 30, 33, 38.*

Hydrangea quercifolia (6-5B)
OAK-LEAF HYDRANGEA
Broad, suckering shrub to 4-5 ft. tall. Showy white flowers in early summer, not always produced in New England. Foliage coarse but distinctive. Often shows good red autumn color. Shade-tolerant. FO, HA, KR, LC, LI, PA, PW, RO, TL, WC, WE, 1, 2, 9, 10, 11, 16, 19, 27, 38.

Jasmine

Jasminum floridum (7)
SHOWY JASMINE
Half-evergreen shrub from China to 4-ft. Many small yellow flowers in terminal cymes. Summer-flowering. 10, 12.

Jasminum nudiflorum (6)
WINTER JASMINE
Dense shrub to 5 ft. or more. Twigs green. Small yellow forsythia-like flowers in late winter. Flowering is often sparse in the North. More reliable in the mid-Atlantic states than in New York City. CB, DA, EA, ML, PA, TL, WB, 2, 10, 12, 17, 39.

Mountain-laurel

Kalmia latifolia (4)
Dense evergreen shrub growing rather slowly to 12 or more ft. May be kept to smaller height by selective pruning, or may

even be trained as a small tree. The small white or pink-tinged flowers that appear in late May or June are attractive from near or far. Shade-tolerant. Acid soil. Splendid. BL, CB, FO, GA, KR, LA, LT, PW, SH, SP, TL, VI, WB, WC, WF, 11, 19, 25, 27, 36.*
Selected Forms (red-budded, pink-flowered, etc.): GR, SP, WP, WE, WF.

Kerria

Kerria japonica (4)
Single-flowered Kerria
Shrub to 4 ft. with 2-in.-wide bright yellow flowers in early May. Flowers single. Green stems provide winter interest. Shade-tolerant. FO, SH, TL, WB, WC, WE, 11, 19, 41.
Selected Form: **'Picta'.** Variegated white foliage. Dense mound. WA, 41.

Kerria japonica 'Pleniflora' (4)
Double-flowered Kerria
Dense shrub to 6-8 ft. with conspicuous globe-shaped flower clusters in early May. Occasional flowers in summer. Thicket-forming. CB, CO, KE, KR, RO, SH, WC, WE, 2, 23, 27, 33, 38.

Beauty-bush

Kolkwitzia amabilis (4)
Vigorous, tall-growing, vase-shaped shrub. Showy pink flowers a bit later than most other spring-blooming shrubs. Flower color variable. BU, CB, CO, FE, GU, KE, LT, MA, PT, SA, WB, WC, 10, 11, 14, 15, 22, 30, 33, 39.*
Named Form: **'Ruys Pink'.** IN.

Crape-myrtle

Lagerstroemia indica (7-6B)
Shrub to 10 ft. or more, or a small tree with attractive mottled bark. Beautiful in flower in the summer. Color ranges from pink to red or white, depending on the particular shrub. May be treated as a die-back in warmer parts of the North, but it is most spectacular in the South. Many named forms. BU, CB, HA, IN, MB, ML, NE, PT, SN, TL, WB, 1, 12, 17, 18, 22, 25, 29, 38, 40.*
Selected Form: **'William Toovey'.** Deep rose. TL, 17. Dwarf crape-myrtle forms available from HA, ML, 22. Reportedly hardier dwarf forms available wholesale from Otto Spring Nursery, 1220 East Sixth Street, Okmulgee, Oklahoma 74447.

Bush-clover

Lespedeza thunbergii (Desmodium penduliflorum) (5)
Shrub to 4-5 ft. with gracefully arching stems. Conspicuous rose-purple, pea-like flowers in very late summer. Useful for dry soils. WE.

Honeysuckle

Lonicera fragrantissima (6-5B)
Winter Honeysuckle
Vase-shaped shrub to 7 ft. or more. Twiggy. Highly scented small flowers in early spring. Leaves retained until late autumn. CB, DU, FO, KR, LC, SA, SN, ST, TL, WB, WE, 1, 2, 10, 11, 12, 27, 30, 39.*

Lonicera morrowii (3)
Dense shrub to 5-6 ft., usually broader than tall. Yellowish-white flowers in mid-May. Dark red berries in early summer. EI, FO, MA, SH, SP, 10, 19, 27, 38.

Lonicera tatarica (3)
Tatarian Honeysuckle
Vigorous shrub to 8 ft. or more. Handsome flowers in mid-May, followed by red berries in early summer. Like most honeysuckles, it is tolerant of poor soil. BU, DU, FE, GU, KE, TL, 12, 19, 35.
Selected Forms: **'Alba'.** White flowers. BA, FO, GU, PV, RH, 10, 11, 27.
'Arnold Red'. Darkest red flowers of any honeysuckle. CB, CH, CO, CR, IN, KS, MA, MB, NE, PN, SA, SH, VA, 2, 39.
'Lutea'. Pink flowers and showy orange-yellow berries. WE.
'Rosea'. Pink flowers. CR, FO, GU, HG, KE, MA, RH, SN, WB, 9, 10, 11, 30, 38.
'Zabelii'. Dark red flowers. Excellent. BA, BU, FE, GI, HA, KE, KS, LT, MA, NE, PV, SH, WB, 1, 2, 6, 17, 19, 27, 30.*

For other **Lonicera** *see pages 60, 72.*

Magnolia

Magnolia liliflora 'Nigra' (soulangiana nigra) (6-5B)
Lily-flowered Magnolia
Spreading shrub to 8 ft. or more. Flowers dark purple outside, light purple inside. Flowers mid- or late May after the common spring-blooming magnolias. Some botanists consider *M. quinquepeta* the correct name for *M. liliflora*. GI, GO, LI, NE, PT, WB, WC, 4, 10, 19, 22, 33.

Magnolia stellata (5-4B)
Star Magnolia
Shrub or small tree to 10 ft. or more. Showy white flowers in early spring. In the North it is best planted in an unprotected spot so that the flowers, which are often damaged by spring frosts, will be delayed a few days. Technically a variant of *M. kobus* though the garden differences are many. Of interest

every season of year. BU, FO, LC, LL, OL, PT, PW, SP, WB, WE, 1, 6, 11, 12, 16, 17, 27, 29, 32.*

Selected Forms: **'Royal Star'.** Flowers larger, reportedly hardier in bud. GO, SA, SH, 2, 20, 22, 36.

'Rubra'. Pink flowers. (Another form, **'Rosea'**, is usually pink only in bud). LL, TL, 11.

'Waterlily'. Flowers slightly larger than in the species, tinged peppermint. Bushy, upright. GO, LL, SH, TL, 36.

For other **Magnolias** *see pages 22, 29.*

Sargent Crab-apple

Malus sargentii (4)

Dense shrub to about 6 ft., often broader than tall. Attractive white flowers in early May. Very small red fruit sometimes retained into winter. BA, CB, DU, FO, LC, LT, MA, OL, PV, RO, SI, SP, TL, WE, 1, 6, 11, 27, 31, 33.*

Mock-orange

Philadelphus coronarius (4)

COMMON MOCK-ORANGE

Shrub to 7-8 ft. Intensely fragrant white flowers, 1-1-1/2 in. across, late May. Much of the material in the trade may be a scentless larger-flowered hybrid. Advisable to purchase locally at time of flowering so that fragrance may be verified.

Philadelphus lewisii 'Waterton' (4)

Compact, to 4 ft. Odorless white flowers in late May. AE, JA, 41.

Philadelphus 'Minnesota Snowflake' (4-3B)

To 8 ft. Fragrant white flowers, 2 in. across. BA, BT, CO, FA, FE, FO, KE, KR, MA, NE, PV, SA, WB, WE, 2, 10, 22, 30, 38, 39.*

Philadelphus 'Silver Showers' (4?)

Dense, to 4 ft. or more. Flowers single. WC, WE, 6.

Philadelphus virginalis 'Virginal' (4)

VIRGINAL MOCK-ORANGE

Leggy shrub to 7 ft. or more. Highly fragrant double-white flowers, 2 in. across. BO, CO, EM, GU, HA, IN, KE, KS, LE, LT, MU, PT, PV, SN, 1, 17, 27, 29, 30, 39.*

Other forms from FA, FO, GU, LC, MA, RH, SA, SH, 23.

Pieris

Pieris japonica (6-5B)

JAPANESE PIERIS (ANDROMEDA)

Refined evergreen shrub to about 7 ft. Drooping clusters of white bell-shaped flowers over a long period in April. Of year-round interest. Commonly and misleadingly called "andromeda." Member of heath family. CB, GI, KE, LT, MU, PT, SH, SI, SP, TL, VI, WB, WC, 1, 11, 22, 25, 27, 32, 33.*

Selected Form: **'White Cascade'.** GR, HH, PA, 22, 36.

Pieris taiwanensis (7-6B)

TAIWAN PIERIS

Evergreen shrub to about 5 ft. Long drooping clusters of white flowers in early spring. GR, PA, TL, WE, 21.

For other **Pieris** *see page 73.*

Cherry, Flowering Almond

Prunus besseyi (3)

WESTERN SAND CHERRY

Shrub to 5-6 ft. with attractive small white flowers in early May. More-or-less edible purplish-black cherries in early summer. Foliage lustrous. FA, FO, GU, SI, 30, 33.

Selected Form: **'Hansen'.** Abundant flowers and fruit. BU, GU, KE, KR, MA, SN, 23.

Prunus tomentosa (3)

NANKING OR MANCHU CHERRY

Shrub to 6-7 ft. with showy white flowers in mid-April, followed by conspicuous red fruit. Attractive bark and foliage. FA, FE, FO, GU, KS, LC, MA, MU, RH, SH, SI, SN, VA, WC, WE, 6, 19, 30, 33, 38.

Prunus triloba (triloba 'Multiplex') (4-3B)

FLOWERING ALMOND

Spreading shrub to 8 ft. or more. Showy double pink flowers in mid-April. BA, BU, CB, CO, FA, FE, KE, KR, KS, LC, MA, PN, PV, RH, SA, SH, WC, 6, 30, 33.

For other **Prunus** *see pages 16, 26, 61, 73.*

Pomegranate

Punica granatum (7)

Deciduous shrub to 8-10 ft. with scarlet flowers in May, June. Double-flowered form is the most common. EA, HO, PT, 12, 22, 29.

Yeddo-hawthorn

Raphiolepis umbellata ovata (7)

Attractive compact shrub to 6 ft. with rounded leathery evergreen leaves. Fragrant white flowers in May are followed by blue-black fruit. Mainly for the South and West. 4, 18, 22, 29, 33.

Azalea

Rhododendron arborescens (4)

SWEET AZALEA

Shrub to 6 ft. or more. Fragrant white flowers in early June. Azaleas are part of the large rhododendron genus, but for clarity most nurseries list them separately. LA, PW, RO, V1, WE, 11, 19.

Rhododendron calendulacum (5-4B)
Flame Azalea
Shrub to 6-8 ft. with showy and long-lasting orange flowers in late May. Flowers sometimes yellow or scarlet. BL, DA, GA, GI, GS, LA, OL, PW, SQ, V1, WB, 8, 19, 27.

Rhododendron canadense (3-2B)
Rhodora
Azalea to 3 ft. with rose-purple flowers in late April. Best grown under cool, moist conditions. For the natural garden. BP, GA, SJ, WE.

Exbury Azaleas (6-5)
Deciduous hybrids of complex parentage. Large flowers, ranging in color from orange to pink, red and creamy white. Eventual height 8 ft. or more. Best to purchase named forms.
Named forms from: BL, GI, GR, HH, 1S, L1, OL, PW, SH, SP, WE, WF, 16, 19, 20, 25, 27, 32, 33, 34.*

Rhododendron gandavense (4)
Ghent Azalea
Mixed hybrid deciduous azaleas to 5 ft. or more. Flowers white to pink and orange. Some double-flowered. Many named forms.
Named forms from: EI, GR, HH, SH, WE.

Glenn Dale Azaleas (based on R. obtusum) (6-5B).
Semi-evergreen shrubs to 4 ft. or more. Flowers range from red to pink and white and lavender. Many outstanding named forms. GR, HA, HF, HH, OL, SW, TL, 1, 21, 22, 40.

Rhododendron kosterianum (molle x japonicum) (5)
Mollis Hybrid Azaleas
Deciduous shrubs to about 5 ft. Showy yellow to red flowers in mid- to late May. Many named forms. CB, DA, EI, GR, HH, L1, WC, WE.

Rhododendron molle (5)
Chinese Azalea
Shrub to 5-6 ft. with yellow flowers in mid-May. Many plants listed as such are probably hybrids with *R. japonicum*. BA, CB, FA, FO, GU, KE, PV, RH, RO, SN, WE, 7, 9, 11, 16, 19, 27, 32, 33, 36.

Rhododendron mucronatum (ledifolium album) (6-5B)
Snow Azalea
Excellent dense evergreen or nearly evergreen shrub to 4-5 ft. Fragrant white flowers in late April. Not always of reliable hardiness in New England. CR, DA, FO, KI, LI, LT, SP, SQ, TL, 9, 11, 17, 19.

Rhododendron nudiflorum (4-3B)
Pinxterbloom Azalea
Shrub to 5-6 ft. with light pink flowers in mid-May. Deciduous. EA, E1, GA, GR, LA, PW, RO, VI, 11, 19, 27.

Rhododendron obtusum japonicum hybrids (7-6)
Kurume Azaleas
Dense evergreen shrubs to 3 ft. Single or double flowers ranging in color from white to pink and red. Considerable variability in hardiness, some being hardy as far north as Long Island.
Many named forms: GR, HA, HH, NE, NU, OL, PT, SE, S1, SW, TH, TL, WB, 1, 11, 17, 19, 25, 33, 40.

Rhododendron obtusum kaempferi and hybrids (5-4B)
Torch Azalea
Dense deciduous shrub to 6 ft. or more. Flowers from red to pink and orange. Free-flowering. CH, CR, EI, FO, HH, LT, SQ, SW, TL, WE, 1, 5, 11, 22, 25, 33.

Rhododendron roseum (4-3B)
Rose-shell Azalea

George Taloumis

The highly fragrant old favorite, virginal mock-orange, bursts into bloom in late May.

Deciduous, to 6 ft. or more. Fragrant bright pink flowers in mid-May. BL, RO, WE.

Rhododendron schlippenbachii (4)
ROYAL AZALEA
Ultimately a tall shrub (to 15 ft.). Fragrant large flowers, usually a good pink, in full bloom usually by early May. Good autumn color. DA, FO, GR, LI, OL, RO, SP, TL, WC, WE, 8, 11, 33.

Rhododendron vaseyi (4)
PINK-SHELL AZALEA
Shrub to 5-6 ft. with light rose flowers in early May. Usually good autumn color. BP, CH, EA, GA, GR, LA, OL, PW, RA, RO, VI, WE, 11, 16, 19, 32.
Selected Form: **'White Find'**. Flowers white. BP, LA, PW.

Rhododendron viscosum (3)
SWAMP AZALEA
Shrub to 6-8 ft. with intensely fragrant, white or whitish-pink flowers in early summer. Good autumn color. Tolerant of wet sites. GA, GR, LA, LT, OL, PW, RO, VI, WE, 8, 11, 19, 27.

Rhododendron yedoense poukhanense (4)
KOREAN AZALEA
Dense shrub to 3-4 ft. with fragrant petunia-purple flowers in early May. Deciduous or semi-evergreen. Often listed as *Azalea poukhanensis*. CH, CR, EI, FO, GR, HH, HO, LA, LI, NE, RO, SP, SQ, WE, 11.

For other **Azaleas** *see end of* **Rhododendron** *listing; also* BP, DA, GI, HF, HH, IS, LI, NU, PA, PT, PW, TL, WE, 9. *For* **Dwarf Azaleas** *and* **Rhododendrons** *see page 74.*

Rhododendron

Rhododendron carolinianum (5-4B)
CAROLINA RHODODENDRON
Compact shrub to 4-5 ft. with handsome short evergreen leaves. Light rosy-purple to pink flowers in early May. BL, BP, CB, GA, GR, HH, JA, LA, LT, OL, PW, RA, SP, TL, WB, WE, 9, 11, 19, 32.
Selected Form: **'Album'**. GR, LA, RA, WE, 19.

Rhododendron catawbiense (4)
CATAWBA RHODODENDRON
Shrub to 5 ft. or more, 5-in.-long evergreen leaves. Rose-purple flowers in late May. BP, FO, GA, KE, LA, LC, LT, SQ, WB, WE, 7, 11, 12, 19, 34. There are many named *catawbiense* hybrids with flowers ranging from red and purple to white. CO, GI, HH, LI, WE, 11.

Rhododendron fortunei (6)
FORTUNE RHODODENDRON
Shrub to 8 ft. or more with long evergreen leaves. Rosy-lilac or bluish-pink flowers in mid-May. LG, GR.

Rhododendron laetevirens (carolinianum x ferrugineum) (5-4B)
WILSON RHODODENDRON
Compact evergreen shrub to 4-5 ft. grown more for its pieris-like leaves than its small purplish-pink flowers in late May. Usually listed as *R. wilsonii.* BP, CB, DA, HF, HH, OL, WA, WE, 11, 33.

Rhododendron maximum (4-3B)
ROSE BAY RHODODENDRON
Tall evergreen shrub, almost tree-like to 20 ft. or more under good growing conditions. Flowers rose to purple-pink in mid-June, often obscured by the long leaves. Useful because of its exceptional hardiness. BL, BP, DA, EI, GA, KE, LA, LI, LT, PW, SP, SQ, TL, VI, WB, WE, 7, 11, 19.

Rhododendron mucronulatum (4-3B)
KOREAN RHODODENDRON
Deciduous shrub to 5-6 ft. with rose-purple flowers in late March or early April. Repeat flowering in mild autumns. Buds sometimes suffer frost injury in parts of New England. Azalea-like in appearance, but a true rhododendron. BP, CH, CO, GR, OL, RO, WE. Pink-flowering forms, including **'Cornell Pink'**, available from BP, GR, OL, RA, WE, 32.

Rhododendron smirnowii (4)
SMIRNOW RHODODENDRON
Evergreen shrub to 6 ft. or more. Numerous white to rosy-red flowers in mid-May. Leaves woolly-white beneath. GR, KI, RA, WE, 11.
Named hybrid rhododendrons available from many firms, including BL, BP, CB, FO, GO, GR, HF, HH, IS, PW, RA, SE, TL, WE, 21, 22, 25, 27, 33, 34.* Some of more than passing note are **'Boule de Neige'** (white flowers); **'Ben Moseley'** (pink); **'Caroline'** (fragrant pink flowers); **'Champagne'** (cream); **'Christmas Cheer'** (early white flowers on compact shrub); **'Cunningham's White'** (white); **'Duke of York'** (pale lilac); **'Janet Blair'** (pink); **'Kettledrum'** (magenta with yellow markings); **'Lady Armstrong'** (magenta with deeper markings); **'Lee's Dark Purple'**; **'Pink Twins'** (semi-double flowers); **'Pioneer'** (early rose-colored flowers); **'Roslyn'** (late purple); **'Scintillation'** (pink); **'Vulcan'** (red); **'Westbury'** (pink); **'Wheatley'** (pink).

For **Dwarf Rhododendrons** *see p. 74.*

Currant

Ribes aureum (2)
GOLDEN CURRANT
Vigorous shrub to about 6 ft. with conspicuous yellow, usually fragrant flowers in late April. Many currants serve as alternate hosts for white pine blister rust and should not be planted where 5-needle pines are prevalent. BN, FO, HE, SH, VA.

Ribes odoratum (4)
CLOVE CURRANT
Similar to golden currant but with more intensely fragrant flowers. In fact, the flowers are among the most highly scented of any shrub hardy in the North. BA, FO, ML, PV.

Ribes sanguineum 'King Edward VII' (5)
Shrub to 4-5 ft. with small dark green leaves. Red flowers in early May. More satisfactory in New York City than most plants from the Northwest, but will occasionally suffer winter injury. WE.

Rose

Rosa harisonii (foetida x spinosissima) (4)
HARISON'S YELLOW ROSE
Shrub to 4-5 ft. with attractive double yellow flowers in late May. Fruits inconspicuous. The rose species that follow are of simple culture and do not need the coddling associated with hybrid teas. The fruits or "rose hips" of many species are an attraction to wild-life. AE, FE, GU, KG, KS, MA, RH, TI, WY.

Rosa hugonis (5-4B)
FATHER HUGO ROSE
Shrub to 5-6 ft. with single yellow flowers in mid-May. Important because it is usually the first rose to bloom in spring. Fruits dark red. CR, FA, KE, KG, LE, MA, MB, SH, TI, WC, WE, WY, 10, 11, 27, 41.

Rosa moyesii (5)
MOYES ROSE
Vigorous shrub to 7 ft. or more. Deep red single flowers in early June. Conspicuous 2-1/2 in.-long, orange-red fruits in autumn. KG.

Rosa multiflora (5-4B)
MULTIFLORA OR JAPANESE ROSE
Strong-growing shrub to about 8 ft. Numerous small white flowers in early June. Long-lasting small red fruits in autumn. Valuable shrub for wild-life, but has become weedy in many areas. GU, IN, KE, KR, MB, MU, SH, SN, WE, 12, 19, 27, 30, 35, 37, 38.

Rosa pomifera (5)
APPLE ROSE
To 5 ft., with single pink flowers in late May or June. Grown mainly for its odd, somewhat pear-shaped, 1-1/2-in.-wide red fruit. FA, KG.

Rosa rugosa (3-2B)
RUGOSA ROSE
Variable shrub to about 5 ft. with attractive wrinkled foliage. Flowers range from magenta to white, late May. Occasional flowers produced in summer. Showy red fruits from summer to autumn. Good orange fall color. Especially useful along the sea shore. BA, DU, KE, KG, LT, MA, MU, PV, SH, TI, TL, VI, WY, 1, 11, 17, 27, 30, 32, 38.*
Selected Form: **'Alba'.** White flowers. CR, KG, LT, RO, TL, WC, WE, 10, 11, 19, 27, 32.
Rugosa hybrids from: FA, FE, GU, KG, LT, MA, MB, SH, TI, WY, 10.

Rosa spinosissima 'Altaica' (4)
SCOTCH ROSE FORM
Shrub to 4 ft. or more, with 3-in.-wide yellow flowers in late May. BN, LC.

Rosa virginiana (lucida) (3)
VIRGINIA ROSE
Shrub to about 5 ft. with magenta or pink flowers in early June. Single. Shiny leaves turn scarlet or orange in autumn. Red fruits. KG, LC.

For other **Roses** *see pages 62, 75.*

Flowering Raspberry

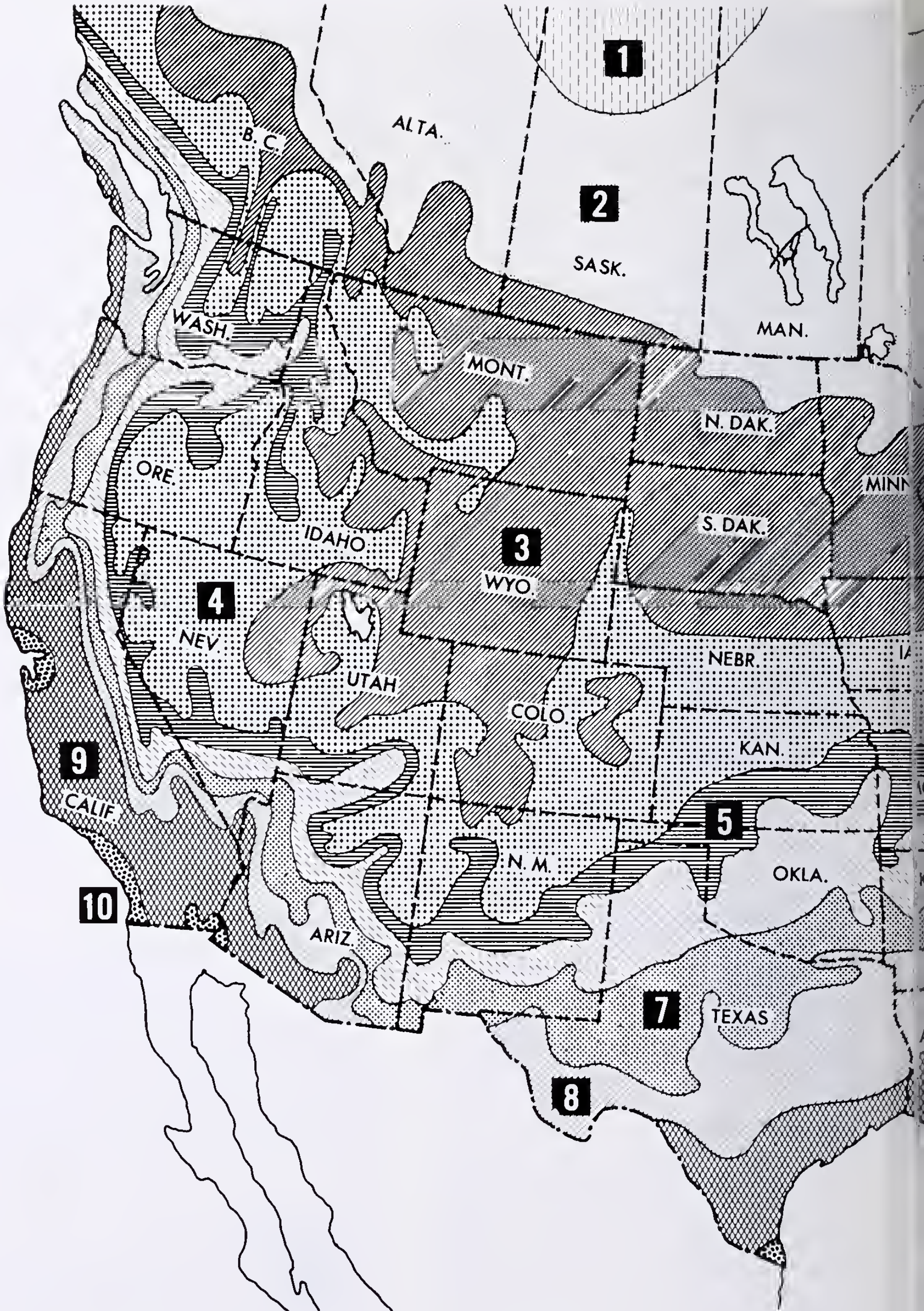
Rubus odoratus (3)
Thornless shrub to 6-7 ft. with coarse maple-like foliage. Fragrant purplish-rose flowers in early summer. Edible fruit. Shade-tolerant. GA, GS, WE.

Willow

Salix caprea (4)
PUSSY WILLOW (EUROPEAN GOAT WILLOW)
Vigorous shrub to 10 ft. or more. Effective in late winter with its velvety gray catkins upon which bright yellow stamens eventually appear (on staminate plants). Suited for moist soils, but will also grow well under average garden conditions. Prune severely in early spring for a good "crop" of pussy willows the following winter. BA, CO, CR, FO, GI, KE, LA, LC, LE, PV, SH, WC, WE, 15, 17, 27, 30.

Salix discolor (3-2B)
AMERICAN PUSSY WILLOW
Catkins slightly smaller than those of the preceding, but useful in northern areas. BU, CH, FE, FO, LC, LT, RO, WB, 1, 10, 11, 15, 19, 30, 33, 38.

Salix gracilistyla (5-4)
KOREAN ROSE-GOLD PUSSY WILLOW



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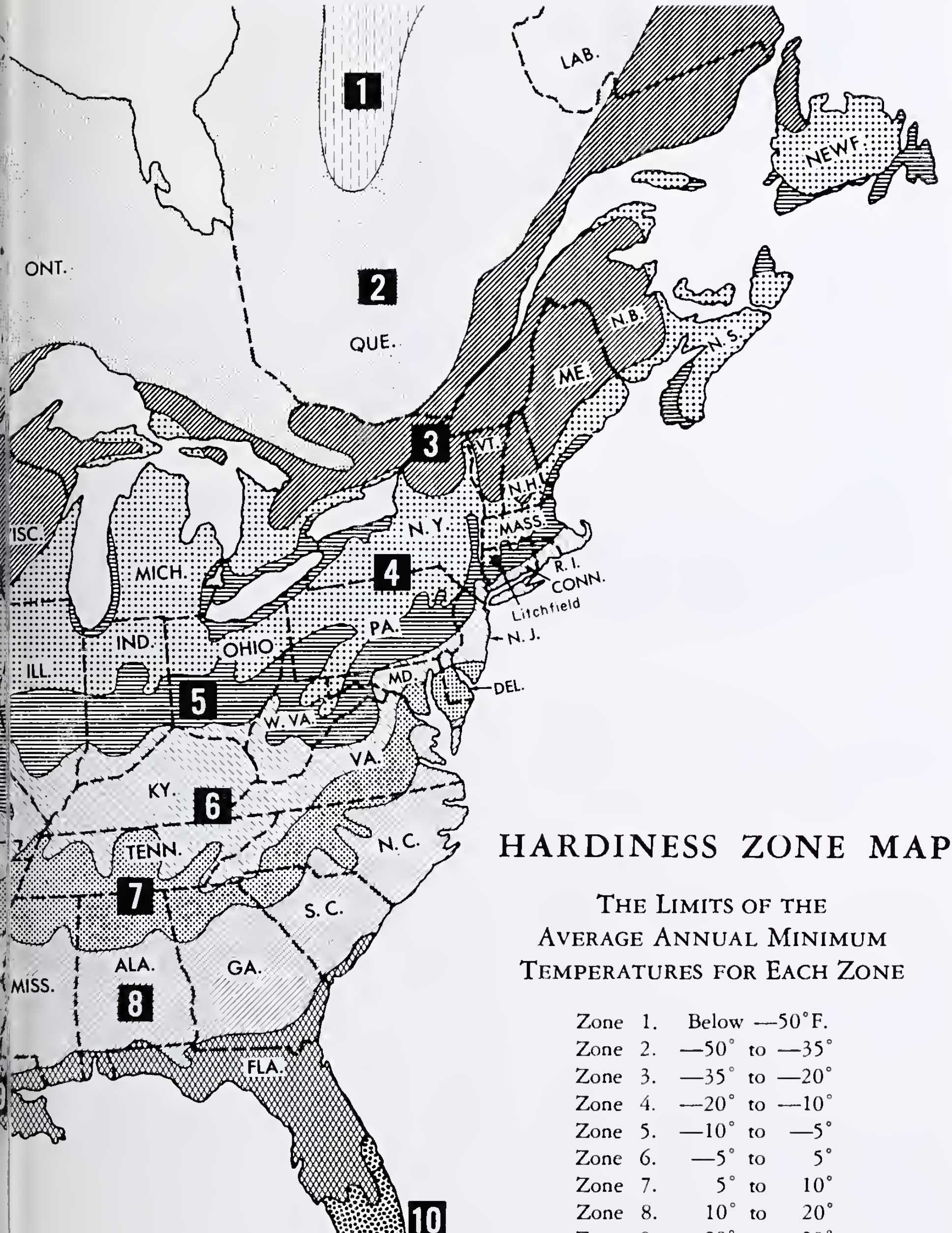


HARDINESS ZONE MAP

THE LIMITS OF THE AVERAGE ANNUAL MINIMUM TEMPERATURES FOR EACH ZONE

Zone 1.	Below —50°F.
Zone 2.	—50° to —35°
Zone 3.	—35° to —20°
Zone 4.	—20° to —10°
Zone 5.	—10° to —5°
Zone 6.	—5° to 5°
Zone 7.	5° to 10°
Zone 8.	10° to 20°
Zone 9.	20° to 30°
Zone 10.	30° to 40°

Compiled by The Arnold Arboretum, Harvard University

Shrub to 6-7 ft. Pinkish catkins and yellow stamens. FO, 38.

For other **Willows** *see pages 17, 62, 75.*

Ural False-spirea

Sorbaria sorbifolia (2)
Strong-growing shrub to 6 ft. with showy white flowers in early summer. Useful on banks. BA, CO, FO, PN, PV, SH, VA, 41.

Spirea

Spiraea arguta (thunbergii x multiflora) (4)
Garland Spirea
Handsome shrub to 5 ft. with white flower clusters. Resembles *S. vanhouttei* but blooms several weeks earlier. FO, GU, LC, MA, SH.

Spiraea billiardii (douglasii x salicifolia) (3)
Billiard Spirea
Upright shrub to 4-5 ft. Tall dense "steeples" of rose-colored flowers in mid-June. BN, EM, LC, 11, 19, 30, 38.

Spiraea macrothyrsa (douglasii x latifolia) (4)
Similar to the preceding, but with horizontal branches. FO, KE, LE, WC, 1.

Spiraea nipponica (4)
Snowmound Spirea
Shrub to about 6 ft. with numerous flat clusters of small white flowers in mid-May. Foliage nearly bluish-green. BA, CO, FE, FO, KR, KS, LC, MA, NE, PV, RH, RO, SA, WC, WE, 1, 6, 27.

Spiraea prunifolia (5)
Bridal-wreath Spirea
Shrub to 6-7 ft. with white button-like flowers in early May. Lustrous foliage turns orange-scarlet in autumn. CB, EI, FO, GI, LC, LE, LI, MB, PT, RO, SP, WB, WC, WE, 1, 10, 19, 22, 27, 38.

Spiraea thunbergii (4)
Thunberg Spirea
Slender-branched shrub to about 5 ft. Pure white flowers along the stems in late April. Needs more pruning than most spireas because its numerous small twigs die out unexpectedly. BA, DA, FO, GI, LE, PV, RH, RO, WB, 10, 12, 19, 38.

Spiraea trichocarpa (5)
Korean Spirea
Spreading shrub to 6 ft.; 2-in. clusters of white flowers in late May. PN, SH, VA.

Spiraea trilobata (4-3B)
Hawthorn-leaf Spirea
Shrub to 3-4 ft., resembling *S. vanhouttei* but smaller in every part. Mid-May. AE, BN, LC, PN, VA, 23.

Spiraea vanhouttei (cantoniensis x trilobata) (4)
Vanhoutte Spirea
Dense shrub to 5-6 ft. with showy clusters of pure white flowers along arching branches. Mid-May. Common, with reason. BA, FE, GU, HA, KE, KS, LT, MA, PT, PV, SH, SN, WB, 1, 2, 12, 15, 22, 27, 30, 39.*

For other **Spireas** *see page 76.*

Lilac

Syringa chinensis (rothomagensis) (laciniata x vulgaris) (4)
Chinese Lilac
Shrub to about 10 ft. with loose panicles of purple-lilac flowers in mid-May. Leaves smaller than those of *S. vulgaris*. Incorrectly called "Persian lilac" in many catalogs. BA, CO, EI, FE, FO, LI, MB, NE, WE, 1, 6, 11, 17, 27, 30.

Syringa josikaea (2)
Hungarian Lilac
Shrub to 8 ft. or more. Lilac-violet flowers in late May. Leaves shiny green. VA, 22.

Syringa meyeri (5)
Dense shrub to 7-8 ft. with dark purple flowers in late April or early May. Not intensely fragrant. The lustrous foliage is retained in good condition at the Brooklyn Botanic Garden through summer, a time when the effect of air pollution on lilacs is severe. IN, KS, LC, MB, VA.

Syringa microphylla 'Superba' (5)
Daphne Lilac Form
A cultivar of the daphne lilac with deep pink flowers in early May. Broader than tall at maturity. Eventual height about 6 ft. CB, CO, LC, SH, WC.

Syringa patula (velutina) (palibiniana) (4-3B)
Small-leaved shrub to 6-8 ft. Lilac flowers in 6-8 in. panicles. Early to mid-May. Sometimes called "rock garden lilac" because of its fairly slow growth. BA, BU, CB, CO, FE, KE, MA, PV, RH, SA, SH, WC, WE, 6, 8, 11, 15.
Named Form: **'Miss Kim'.** Flowers light lavender. BA, CH, FA, KR, PV, TL, WC, 6.

Syringa persica (afghanica x laciniata) (4-3B)
Persian Lilac
Multi-stemmed shrub to 5-6 ft. with small leaves. Pale lilac flowers in mid-May. Often confused with *S. chinensis*. BU, EM, FO, GI, GU, HG, KS, MA, PN, PV, RO, SA, SP, VA, 10, 11, 29, 38.
Selected Form: **'Alba'.** Flowers white. EI, LI.

Syringa prestoniae (reflexa x villosa) (2)
Preston Lilac
A hybrid group of lilacs growing to 8-9 ft.,

The double flowered Japanese snowball viburnum is spectacular in bloom, but a non-sterile variety of *V. plicatum* should be chosen if fruit is desired.

George Taloumis

with attractive flowers ranging from pink to purple and white. Late May. Not very fragrant, but among the hardiest of all lilacs.
Selected Form: **'James MacFarlane'.** Flowers pink. BA, CB, CH, CR, FA, LI, MA, RH, RO, SA, SH, SP, SQ, TL, WC, WE, 2, 6, 11.
Other Named Forms: BN, CO, SH, VA.

Syringa pubescens (5-4B)
Shrub to 5 ft. or more. Whitish-lavender flowers in late April. One of the most highly scented lilacs. Relatively poor growth habit. DA.

Syringa villosa (3-2B?)
LATE LILAC
Dense upright shrub to 7-8 ft. with rosy-lilac or white flowers. Late May. Not very fragrant. AE, EI, FO, GU, LC, LI, SH, WE, 11, 19, 30.

Syringa vulgaris (3)
COMMON LILAC
Shrub to 15 ft. or more. Fragrant flowers in early May. Color range: purple to pink, yellow and white. Flowers single or double. A rugged well-known dooryard shrub, but susceptible to mildew, scale and borers. Best to purchase "own-root" lilacs to avoid privet graft blight. Nearly all lilacs are prone to air pollution injury, especially *S. vulgaris* and its many forms. Better than average selection of named forms, often called "French hybrids," available from: BA, CB, CO, FA, FE, GI, GU, HE, KS, LL, MA, PV, SH, WC, WE, 6, 11, 15, 22, 23.*

Tamarisk

Tamarix hispida (4?)
KASHGHAR TAMARISK
Shrub to 4 ft. or more, with silvery juniper-like leaves. Dainty racemes of pink flowers in the latter part of summer. Like other tamarisks, it grows well in dry, even sandy soil. Not always easy to establish. Best planted in spring, and pruned severely at planting time. RO, 30.

Tamarix pentandra (4-3B)
FIVE-STAMEN TAMARISK
Tall shrub with light green juniper-like foliage. Tolerant of coastal conditions. Pink flowers in mid-summer. Lankiness may be curtailed by a sharp pruning in early spring. MA, SH.
Selected Forms: **'Pink Cascade'.** Flowers light pink. BU, DA, HA, ML, RO, WC, WE.
'Summer Glow' ('Rubra'). Flowers dark pink. BA, FA, FE, GU, IN, KE, MB, PV, WC, WE, ZI.

Viburnum

Viburnum burkwoodii (carlesii x utile) (5)
Burkwood Viburnum
Refined shrub, ultimately to 7 ft. or more. Shiny leaves retained late in autumn. Fragrant pinkish-white flowers in early May. CO, EI, FO, JA, KR, LC, LE, PT, SH, WE, 2, 6, 11, 19, 22, 26, 27, 29, 36, 39.

Viburnum carlcephalum (carlesii x macrocephalum) (5)
Open shrub to 6 ft. or more. Fragrant white flower clusters in mid-May. Despite a mediocre growth habit, it is one of the best viburnums in flower. CB, CO, DA, KE, LI, SH, VI, WC, WE, 2, 11, 22, 26.

Viburnum carlesii (4)
Korean Spice Viburnum
Broadly rounded shrub to about 5 ft. Clusters of fragrant, pinkish-white flowers in early May. Berries black, ripening in early summer, but not dependable. Often grafted on other viburnums. Beware of understock. CB, FE, GU, HA, KE, KR, LT, MA, SA, SH, SN, VI, WC, 1, 2, 16, 17, 27, 32, 39.*
Selected Form: **'Compactum'.** FO, LC, WE, 11.

Viburnum farreri (fragrans) (5)
Fragrant Viburnum
Shrub to 6-7 ft., valued mainly for its scented white flowers in late March. Flower buds pink. The first viburnum to flower in the North. Fruits inconspicuous. FO, SH, 41.
Selected Form: **'Album'.** Buds and flowers white. FO.

Viburnum juddii (carlesii x bitchiuense) (5)
Judd Viburnum
Similar to *V. carlesii*, but with more handsome foliage. Flowers less fragrant. EI, HE, KI, LI, NE, SA, 6, 20.

Viburnum macrocephalum (m. 'Sterile') (6)
Chinese Snowball
Shrub to 8 ft. or more. Rounded 6 in. heads of sterile white flowers in mid-May. The most showy, if least hardy, of the snowballs. Leaves held late in autumn. 26.

Viburnum opulus 'Roseum' ('Sterile') (3)
European Snowball
Tall loose shrub with showy flowers in mid-May. Because of its susceptibility to plant lice, it should be used only where *V. plicatum* is not hardy. None of the snowball forms bear fruit. BA, CB, CO, FE, GU, HA, KE, KR, KS, PT, PV, SN, WB, 10, 11, 15, 19, 22, 30, 33.

Viburnum plicatum (tomentosum 'Sterile') (4)
Japanese Snowball
Shrub to 7-8 ft. with showy rounded heads of sterile white flowers in late May. Saw-toothed oval leaves with prominent veins. The best snowball for the North. CB, HG, NE, RO, WC, WE.

Viburnum plicatum "Mariesii' (4)
Maries Double-file Viburnum
Flat flower clusters surrounded by large sterile florets. Horizontal branching, with flower clusters produced along the branches. Free-blooming. One of the finest flowering shrubs, but it needs much room for proper development. Superb when seen from a second-floor window. Red berries. CB, DA, EI, FO, HG, LC, LI, SA, TL, WC, WE, 1, 2, 6, 16, 19, 26, 33.

Viburnum plicatum 'Roseum' ('Pink Beauty') (4)
Pink Double-file Viburnum
Similar to the above, but with flowers fading pink over a long period. An attractive, rather slow-growing form found many years ago in the Brooklyn Botanic Garden. Best with age. CB, LE.

Viburnum plicatum 'Rotundifolium' (4)
Early Japanese Snowball
Flowers two weeks earlier than the Japanese snowball. LC, LI.

Viburnum plicatum tomentosum (V. tomentosum) (4)
Double-file Viburnum
Similar to 'Mariesii,' but slightly less showy in bloom. Despite its curious nomenclature, this is the species found wild in Japan and China—and the Japanese snowball is a garden form of it. CB, DU, FO, GI, KR, LC, LT, RO, SP, WB, WE, 1, 2, 11, 12, 19, 27, 33, 39.*

Viburnum pragense (rhytidophyllum x utile) (6)
Prague Viburnum
Medium-sized spreading shrub with handsome leathery elliptic leaves that are evergreen. Creamy white flowers in late spring. CB, HE, HG, SA, 2.

Viburnum sieboldii (5-4B)
Siebold Viburnum
Tall shrub, sometimes tree-like, with lustrous 6-in.-long leaves. Flat, wide clusters of white flowers in mid-May. Red berries in summer. Distinctive when trained as a small tree. EI, FO, LC, LT, PA, RO, SA, SP, WC, WE, 1, 2, 9, 11, 15, 16, 17, 19, 27, 36.

Viburnum USDA Selections (5-6)
A series from the National Arboretum selected for flowers or fruits. *V. dilatatum* is prominent, but others are included. Most have American-Indian cultivar names. CH, 2.

For other **Viburnums** *see pages 63, 76.*

Vitex

Vitex agnus-castus 'Latifolia' (V. macrophylla) (5)
CHASTE-TREE
Large mounded shrub to about 10 ft. Graceful gray-green leaves. Valued for its lavender flower spikes in August. Advisable to treat as a die-back shrub in the northern part of its hardiness range. In New York City it requires some pruning each spring, but need not necessarily be treated as a die-back shrub. One of the last shrubs to leaf out in spring. CB, DA, FO, HA, KE, PT, WB, WC, 10, 38.

Other Form: **'Silver Spire'.** Flowers white. CB, WC.

Weigela

Weigela hybrids (5-4B)
Rather uneven-growing, loosely mounded shrubs to 6-7 ft. Showy trumpet-shaped flowers in late April or early May. Weigelas need more than average pruning to look their best. Prune after flowering.

Selected Forms: **'Bristol Ruby'.** Flowers purplish-red. BT, CO, EA, HG, KE, LT, MA, NE, PT, SA, SH, WC, 1, 19, 22, 23, 30, 38, 39.

'Bristol Snowflake'. Flowers white. SH, WC, 2, 23.

'Vanicek' ('Newport Red'). Purplish-red flowers. Slightly hardier than others. (Some catalogs list as "cardinal shrub.") BU, EM, FE, GI, HA, KE, LT, MA, NE, PV, RH, SP, WB, WE, 1, 2, 15, 17, 19, 27, 30.*

For other **Weigelas** *see page 64.*

The white bell-shaped flowers of Japanese pieris persist nearly an entire month in early spring; the leaves are evergreen.

J. Horace McFarland

SHRUBS PLANTED FOR FOLIAGE AND FRUITS

Deciduous Unless Otherwise Noted

Acanthopanax

Acanthopanax sieboldianus (Aralia pentaphylla) (4)
Five-leaf Aralia
Shade-tolerant shrub to 6-8 ft. with small palmately divided leaves retained until late autumn. Thorny. Good for city conditions and for hedges. Flowers inconspicuous. EI, FO, LI, SH, SQ, WE, 1, 11, 19, 23, 27, 41.

Aralia

Aralia elata (4)
Japanese Angelica-tree
Tall spiny shrub or small tree with large doubly compound leaves. Sparsely branched. Umbels of white flowers in mid-summer. Tropical appearance. CO, FO, ML, SH, 11.

Chokeberry

Aronia arbutifolia (4)
Red Chokeberry
Lanky shrub to 7 ft. or more. Attractive small white flowers in mid-May. Autumn foliage usually red, as is the fruit, which sometimes persists into winter. Good for wild-life plantings. DU, FO, KR, VI, 6, 19, 38.

Selected Form: **'Brilliantissima'.** Numerous brightly colored berries. CR, EI, FO, HG, LC, LT, SA, TL, WB, WE, 1, 9, 11, 12, 14, 15, 19, 27.

Aronia melanocarpa (4)
Black Chokeberry
Smaller than the preceding. Berries purplish-black. DU, EI, FA, FO, GA, KS, LC, SA, WE, 6, 11, 14, 19, 38.

Aucuba

Aucuba japonica (7-6B)
Japanese Aucuba
Stout, eventually tall-growing shrub with thick glossy evergreen leaves. Dioecious, with pistillate plants bearing bright red berries. Best planted in shade. Hardier than forms with variegated leaves. DA, EA, PT, WB, 1, 4, 12, 17, 18, 29, 40.

Selected Forms: **'Crotonifolia'.** Leaves spotted white. ML, WA, 21, 29, 33.

'Picturata'. Leaf-center yellow. 18, 22, 29, 33.

'Variegata'. Gold Dust Tree. Shrub with leaves spotted yellow. DA, EA, HA, PT, TL, WB, 1, 4, 12, 17, 18, 21, 22, 25, 29, 33, 40.

Barberry

Berberis chenaultii (gagnepainii x verruculosa) (5)
Chenault Barberry
Evergreen shrub, slow-growing to 4 ft. Refined small leaves. 17, 33.

Berberis julianae (5)
Wintergreen Barberry
Evergreen shrub to 6 ft. with larger, less refined leaves than most evergreen barberries, but of reliable hardiness. Some leaves turn brilliant orange-red in autumn, others remain green. EA, RO, SQ, TL, WB, 10, 11, 12, 14, 17, 22, 27, 33, 39, 40.

Selected Forms: **'Nana'.** Dense, to 3-4 ft. DA, 9, 10, 11, 12, 17, 26, 39.

'William Penn', a hybrid with *B. verruculosa*, is a smaller shrub than *B. julianae* and has slightly more refined foliage. RO, 11, 22.

Berberis koreana (4-3B)
Korean Barberry
Dense deciduous shrub to 5-6 ft. with leaves turning dark red in autumn. Persistent red fruit. DU, FO, LI.

Berberis mentorensis (julianae x thunbergii) (5-4B)
Mentor Barberry
Dense shrub to 5-6 ft. with leaves held late into autumn. Reported to withstand hot dry midwestern summers better than other barberries. DA, EI, FO, HG, KS, LC, LT, RO, SA, WC, WE, 1, 10, 11, 12, 19, 22, 23, 26, 27.

Berberis thunbergii (4)
Japanese Barberry
Common deciduous shrub to 5-6 ft., often used for hedges because of its dense growth, thorniness and small leaves. Fine red autumn color. Red berries held into winter. Tolerant of a wide range of conditions. BU, FE, GU, KE, KS, LT, MA, MU, PT, PV, RH, WB, 1, 11, 12, 15, 22, 27, 30, 33.*

Selected Forms: **'Atropurpurea'.** Purple-leaf Barberry. DU, FA, FE, GU, KE, KS, LT, MA, MU, NE, PT, SA, TL, 1, 11, 15, 22, 27, 33, 39.*

'Aurea'. Leaves bright yellow if grown in full sun. Slow-growing. CB, KE, ML, SN, WC.

'Erecta'. Erect, compact form useful for hedges. 1, 23, 30.

'Rosy Glow'. Leaves first purple, then with

white markings. A novelty, but handsome if properly used. KE, WC, 1, 5, 20, 22, 29, 33.
'Thornless'. BA, MA.

For other **Barberries** *see page 65.*

Boxwood

Buxus sempervirens (6-5B)
Common Box
Dense evergreen shrub to 10 ft. or more. Best development occurs in the mid-Atlantic states. Subject to snow damage and winter burn northwards. A common hedge plant in the South. Many kinds. PT, RO, TL, WB, WE, 5, 10, 11, 13, 15, 17, 19, 26, 29, 38.
Selected Form: **'Inglis'.** Densely pyramidal. Satisfactory in colder areas. 22.

See also page 66.

Beauty-berry

Callicarpa dichotoma (purpurea) (5-4B)
Korean Beauty-berry
Upright shrub to 6-7 ft. Distinctive small lilac-violet berries in autumn. AL, CB, DA, ML, TL, 11, 39.

Callicarpa japonica 'Leucocarpa' (5)
White-fruited Beauty-berry
To 5 ft. or more. Small but abundant white berries persisting in autumn. One of the best shrubs with white fruits. FO.

Pea-shrub

Caragana arborescens (3-2B)
Siberian Pea-shrub
Tall upright shrub with fairly refined small compound leaves. Bright green. Yellow pea-like flowers in mid-spring. Mainly for the Northern Plains. Hedge plant. BA, DU, EI, FA, FO, GU, KS, LC, PN, PV, VA, WE, 11, 23, 30, 38.
Selected Form: **'Lorbergii'.** Feathery leaves. AE, PN, SH, VA, WE.

Caragana microphylla (3)
Shrub to 6 ft. or more with long spreading branches. Tiny leaflets. BN.

Cleyera

Cleyera japonica (7)
Tall shrub with glossy evergreen leaves. New growth red. Fragrant white flowers in summer followed by red berries. A choice plant for southern gardens. Some plants offered may be *Ternstroemia gymnanthera.* HA, 1, 22, 40.

Dogwood

Cornus alba (3-2B)
Vigorous shrub to 7 ft. or more. Grown for its winter twig color; also for the variegated leaves of some forms. The latter are more tender. Whitish berries have some late summer interest.
Forms grown for their bright red winter twigs: **'Coral Beauty'.** WC.
'Sibirica' ('Westonbirt'). This and others should be pruned severely in very early spring to encourage strong new growth that will have good color the following winter. CO, FO, KE, LT, PN, RH, RO, SH, WB, WC, WE, 1, 10, 11, 15, 19, 27, 30, 33, 38.
Forms grown for their variegated leaves: **'Argenteo-Marginata' ('Elegantissima').** Leaf margins white. BA, CB, CO, FA, FE, GU, KE, KR, KS, LE, MA, PN, PV, RH, SA, SH, WC, WE, 1.
'Gouchaltii'. Leaves variegated yellow and pink. CO, ML.
'Spaethii'. Leaves with yellow margins. SH, WE, 41.

Cornus amomum (5)
Silky Dogwood
Strong-growing shrub to 7-8 ft. Pale blue berries in summer. Dark red twigs in winter. DU, FO, MA, MU, 35.

Cornus racemosa (paniculata) (4)
Gray Dogwood
To 10-12 ft. White berries on red stalks in early summer. As with other shrubby dogwoods, the clusters of small white flowers are not especially conspicuous. Most are good wild-life shrubs, appearing their best in naturalized parts of the garden. DU, EI, FO, LC, LI, MA, MU, SH, TL, WE, 1, 6, 14, 19, 27, 38.

Cornus sanguinea (4)
Blood-twig Dogwood
To about 8 ft. Black berries in autumn. Like most shrubby dogwoods, foliage turns red in autumn. FO, SH, TL, WE, 10, 17, 19.

Cornus sericea (stolonifera) (2)
Red Osier Dogwood
Robust tall suckering shrub with white berries in summer and bright red winter twigs. Suited for moist spots. AE, BA, FE, FO, KS, LC, MA, SA, SH, TL, VI, YB, 1, 6, 14, 19, 27, 30, 35, 38.*
Selected Form: **'Flaviramea' ('Lutea').** Twigs bright yellow in winter. BA, CO, FO, KS, LC, LT, MA, PV, RH, RO, SA, SH, WE, 1, 11, 15, 16, 19, 27, 30.*

Hazelnut, Filbert

Corylus americana (4)
American Hazelnut
Shrub to 5 ft. or more. The edible nuts are usually smaller than those of *C. avellana.* An addition to wild-life plantings. BO, DU, EI,

Arthur N. Orans

Depending on training and pruning, the Russian-olive *(Eleagnus angustifolia)* can be a small tree or a large shrub. Its dusty silver leaves are a distinctive feature in any setting.

EM, FE, FO, GU, KE, KR, KS, LC, LI, NE, PV, SN, ST, WB, 6, 10, 19.

Corylus avellana (4)
European Hazelnut
Tall spreading shrub to 15 ft. or more. Catkins attractive in late winter. Often cultivated for nuts. EM, KE, ML, NE, TL, 10.
Selected Form: **'Contorta'.** Shrub to 6-7 ft. with sharply twisted branches. An apt catalog name is "Harry Lauder's Walking Stick." Not grown for its nuts. CB, CO, FO, GI, KE, KR, LC, OL, PA, RO, SH, SP, TL, WC, WE, 6, 16, 19, 27, 36.

Corylus maxima 'Purpurea' (5)
Purple-leaf Filbert
Shrub to 10 ft. or more. Leaf color most intense in spring. Full sun. CO, FO, L1, ML, Z1.

Smoke-bush

Cotinus coggygria (Rhus cotinus) (4)
Loosely branched shrub to 10-12 ft. with green leaves. Fluffy gray-to-purple fruiting panicles in summer. Since some plants may have entirely staminate ("male") flowers, it is wise to seek out cutting-grown plants with conspicuous fruit heads. Autumn color orange-to-yellow. CB, DA, FO, LC, L1, LT, MU, RO, SH, SI, WB, WE, 1, 5, 10, 11, 14, 19, 30, 38.
Selected Form: **'Royal Purple'.** Purplish leaves and fruit heads. BU, CB, CO, E1, FE, FO, GU, IN, KR, LC, LE, NE, PV, RO, SA, SH, WC, 11, 19, 33.

Cotoneaster

Cotoneaster acutifolius (5)
Peking Cotoneaster
Tall upright shrub with dull green leaves 2-in. long. Black fruit. Many of the plants in the trade may be *C. lucidus,* which has lustrous foliage. BA, FA, FO, GU, HG, KS, MA, PN, PV, RH, SA, SH, VA, 1, 6, 14, 15, 19, 30.

Cotoneaster divaricatus (5-4B)
Spreading Cotoneaster
Shrub to 5-6 ft. with arching branches and glossy dark green leaves. Leaves small, rather closely set. Bright red berries in autumn. Probably the most refined cotoneaster of medium size. BA, DU, KE, KR, LT, MA, PV, RO, SA, SP, WB, WC, 11, 15, 19, 22, 27, 30, 32, 38.*

Cotoneaster foveolatus (4)
Glossy Cotoneaster

To 6-8 ft. The shiny thick green leaves turn orange or scarlet in autumn. Black berries. LI, SH.

Cotoneaster franchettii (6-5B)
Shrub to 8 ft. with leaves retained late in autumn. Small orange-red berries. DA, EA, WE, 20, 27, 33.

Cotoneaster glaucophyllus (7)
Bright-bead Cotoneaster
Dense evergreen shrub to 6-8 ft. with bright red berries ripening late in the season. PT, 1, 18, 22, 29.

Cotoneaster integerrimus (5)
Rounded shrub to about 5 ft. Many short stiff twigs. Red berries. BN, KS, MA.

Cotoneaster pannosus (7)
Silver-leaf Cotoneaster
Dense shrub with rather small silvery leaves retained far into winter. PT, 29.
Selected Form: **'Nanus'.** HO.

Cotoneaster salicifolius (6)
Willow-leaf Cotoneaster
To 6 ft. or more; 3-in.-long glossy leaves held late in autumn. Nearly evergreen in the South. Red berries. CB, DU, WA, WC, 1, 11, 17, 19, 20, 27.
Selected Form: **Var. floccosus.** Hardier than the species. CB, DA.

For other **Cotoneasters** *see pages 40, 67.*

Cyrilla

Cyrilla racemiflora (6)
Splendid southern shrub native from Virginia to Florida (but hardy in the North); to 10 ft. or more. Attractive pendulous racemes of seed heads held long into autumn. Fiery fall color, especially pretty because the shiny green leaves do not turn completely red at one time. It needs a peaty soil which holds moisture. Fine for bonsai. DI, TL.

Elaeagnus

Elaeagnus angustifolia (3)
Russian-olive. *See page 11.*

Elaeagnus commutata (2)
Silverberry
Thornless upright shrub to 8 ft. with attractive silvery leaves and silver berries. Suckers strongly, but useful where it is native—from Alaska to Minnesota. SH, VA.

Elaeagnus multiflora (4)
Cherry Elaeagnus
Large spreading shrub with inconspicuous but fragrant flowers in early May. Tart though edible red berries in early summer. DU, FO.

Elaeagnus pungens (7-6B)
Thorny Elaeagnus
Dense, broad and eventually tall evergreen shrub. Common in the South, but hardy in slightly protected sites as far north as Long Island. Intensely fragrant small flowers, especially valued for their appearance in October. PT, 29.
Selected Form: **'Fruitlandii'.** Rounded leaves with wavy margins. CB, HA, WB, 1, 4, 10, 12, 22, 40.

Elaeagnus umbellata (4-3B)
Autumn Elaeagnus
Tall spreading shrub with silvery-brown berries turning red in autumn. Young foliage silvery, later dark green. CH, DU, FO, LC, LI, RO, SP, WC, 10, 11, 12, 19, 27, 35, 38.
Named Form: **'Cardinal'.** A strain developed for profuse fruit production. Useful in wild-life plantings but should be used with caution on small properties as it may become a weed. BU, CR, FE, KE, KR, MU, OL, RO, SA, SH, SN, ST, TL, WB, WE, 1, 14, 30.

Euonymus

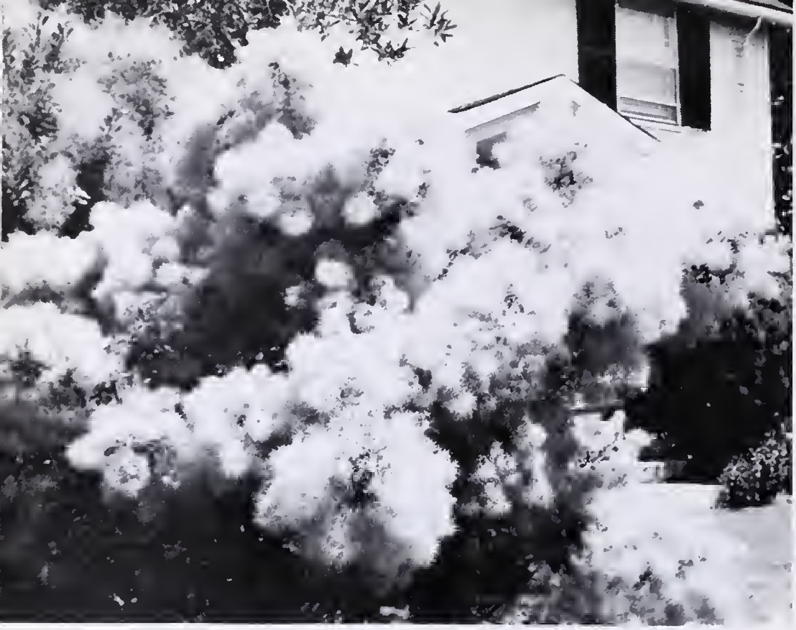
Euonymus alata (3)
Winged Euonymus
Shrub to 8 ft. with corky twigs. Brilliant rose-scarlet autumn color. Conspicuous fruit. DU, KS, LA, MA, PV, RH, SA, SH, TL, VA, WB, WC, 1, 6, 11, 17, 19, 27, 30, 32.*
Selected Form: **'Compacta'.** Dense, to about 5 ft. Twigs not as corky. A fine hedge where scale insects are not bothersome. Memorable autumn color. CO, FA, IN, KS, LE, MA, PW, RH, SN, TL, WC, 1, 2, 10, 11, 15, 27, 29, 30.*

Euonymus europaea 'Aldenhamensis' (4-3B)
Aldenham Spindle-tree
Shrub to 8 ft. or more with dark green leaves. Abundant reddish-pink fruit in autumn. BA, HE, LC, PV, VA, WE.

Euonymus fortunei Emerald Series (5)
Several cultivars selected for uniform growth habit and good green or variegated foliage. Evergreen or nearly so in the northern reaches. CR, FO, KR, OL, SH, SP, 15, 20, 22.

Euonymus japonica (7-6B)
Japanese Euonymus
Upright evergreen shrub to 8-10 ft. Fresh dark green leaves. Often used for hedges in mild climates. Japanese euonymus and forms: 1, 4, 18, 22, 29.

Euonymus kiautschovia (patens) (6-5B)
Spreading Euonymus
Rather loose half-evergreen shrub to 6 ft. Shiny dark green leaves give the appearance of being evergreen in summer. DA, FO, LC, RO, 9, 19, 27.
Selected Form: **'Manhattan'.** EI, IN, KS, MU, RO, SA, SQ, WB, WC, WE, 1, 10, 12, 19, 38.



The aptly named smoke bush *(Cotinus coggygria)* is nearly eclipsed by its fluffy fruiting panicles in mid-summer.

George Taloumis

Euonymus yedoensis (4)
Yeddo Euonymus
Large spreading shrub with pink fruit and brilliant red autumn color. EI, FO, LC, LI, MA.

For other **Euonymus** *see page 69.*

Sea-buckthorn

Hippophae rhamnoides (2)
Open shrub to about 12 ft. with silvery leaves. Bright orange berries retained into winter. Dioecious. DU, PN, SH, VA, VI, WC.

Holly

Ilex aquifolium
English Holly. *See Evergreen Trees, page 29.*

Ilex altaclarensis 'Wilsonii' (aquifolium x perado) (6B)
Vigorous, eventually large shrub. Large evergreen leaves, usually with even toothing. Foliage not as lustrous as in English holly. Pistillate. EA, 18.

Ilex aquipernyi (aquifolium x pernyi) (6B)
Evergreen shrub to 12 ft. or more in the South, much less in the North. Twisted small spiny leaves. This and similar evergreen hollies benefit from winter shade on Long Island. DA, EA, HH, PW, WA, 5, 8, 20, 25, 29.
Selected Form: **'Brilliant'.** Abundant red berries. EA, HH, 22, 29.

Ilex cassine (7)
Dahoon
Evergreen shrub to 10 ft. or more. Abundant red berries. Leaves spineless. An attractive shrub especially suitable for moist soils. 12.

Ilex ciliospinosa (6B)
Upright evergreen shrub to 8 ft. or more. Spiny leaves 1-1½ in. long. Bright red berries. WA, WE, 39.

Ilex cornuta (6)
Chinese Holly
Evergreen shrub to 6 ft. or more. Glossy leaves with 3-pointed tips. Red berries produced on pistillate plants without pollination, but for best fruit production it may be advisable to also plant staminate plants. EA, PT, 12, 22, 25, 29.
Selected Forms: **'Burfordii'.** Buford Holly. Leaves usually spineless, short-tipped. Pistillate. CB, DA, EA, GI, HA, NE, PT, TL, 1, 2, 12, 17, 19, 21, 22, 33, 39, 40.
'Burfordii Nana'. Similar to the preceding, but to 3-4 ft. CB, EA, HA, NE, TL, WA, 1, 2, 12, 17, 18, 22, 25, 26, 29, 33.
'Rotunda'. Compact, slow-growing form with somewhat rounded spineless leaves. Pistillate. HA, PT, 1, 4, 12, 17, 18, 22, 29, 40.

Ilex crenata (5)
Japanese Holly
Dense evergreen shrub to 15 ft. or more. Leaves usually about 1-in. long, but variable. Inconspicuous black berries. Some forms are among the finest broad-leaf evergreens planted in the North. Moderately shade-tolerant. Bonsai, especially small-leaf forms. DA, DU, EA, OL, WB, 11, 19, 25, 32.
Selected Forms: **'Compacta'.** CB, EA, HA,

NE, TL, 1, 9, 11, 12, 17, 22, 25, 26, 29, 39, 40.

'Convexa' ('Bullata'). Box-leaf Holly. Dense, to 6-ft., with small convex leaves. Fine hedge. CR, EA, FO, GI, MU, NE, RO, TL, WB, WE, 9, 11, 13, 17, 19, 25, 27, 32.*

'Microphylla'. Dense upright shrub to 6 ft. Fairly small leaves. RO, TL, WB, 9, 13, 17, 19, 25, 40.

'Rotundifolia'. To 5-6 ft. Comparatively wide short leaves. DA, EA, FO, HA, LI, RO, TL, WB, 10, 11, 12, 13, 14, 16, 17, 19, 25, 26, 38, 40.

For other **Japanese Hollies** *see page 71.*

Ilex 'Edward Stevens' (aquifolium x cornuta) (6)
Horticultural husband of 'Nellie Stevens', (see below). EB, EA, HH, TL.

Ilex glabra (4)
Inkberry
Loose evergreen shrub to 6 ft. or more. Shiny dark green leaves about 1-in. long, not spiny. Suited to moist soils. CH, EA, EI, FO, HG, KI, LT, PW, RO, SQ, WE, 10, 11, 17, 27.

Selected Forms: **'Compacta'.** Dense, to 4-5 ft. CO, DU, EA, GI, LC, TL, WA, WE, 8, 11, 12, 14, 17, 19, 25, 27, 32.

'Ivory Queen'. Berries white. RG, WA, 8.

Ilex laevigata (4)
Deciduous shrub to about 6 ft. Red berries produced on pistillate plants without pollination. Otherwise, much like *I. verticillata* except for its shiny leaves. LC, 1.

Ilex meserveae (rugosa x aquifolium) (5B)
Evergreen, eventually to 7 ft., with attractive small spiny leaves that are lustrous. Cultivars include **'Blue Prince', 'Blue Princess', 'Blue Angel', 'Blue Boy',** and **'Blue Girl'.** CR, RO, SP, WC, WF, 22, 32.

Ilex 'Nellie Stevens' (aquifolium x cornuta) (6)
Evergreen shrub to 8 ft. or more. Red berries produced without pollination, but more abundant fruit occurs when grown near staminate plants of English holly or 'Edward Stevens', (see above). CB, DA, EA, HH, TL, WB, 1, 2, 9, 12, 19, 20, 22, 25, 26, 39.

Ilex opaca (5-4B)
American Holly. *See page 29.*

Ilex pedunculosa (6-5B)
Evergreen shrub or small tree to 10 ft. or more. Leaves spineless, similar to mountain-laurel. Pistillate plants have red berries on long stalks, and, as with most hollies, staminate plants are needed for fruit set. DA, GI, PW, TL, WA, WE, 19, 32.

Ilex pernyi (6)
Evergreen shrub to 10 ft. or more. Pyramidal in youth. Very small, squat, spiny leaves. Clusters of red berries. DA, WA, 25, 29.

Ilex serrata (5-4B)
Japanese Winterberry
Similar to *I. verticillata,* but with smaller red berries abundantly borne. Bonsai. HO, TL, WE.

Ilex verticillata (3)
Winterberry (Black-alder Holly)
Open deciduous shrub to 7 ft. or more. Bright red berries sometimes retained far into winter. Variable. Tolerant of moist soils. DU, GA, KR, LA, LC, LT, SH, SP, TL, VI, WB, WC, 1, 11, 15, 19, 27, 31, 32, 38.*

Named Form: **'Xmas Cheer'.** CB, LC, 32.

Ilex vomitoria (7)
Yaupon
Tall evergreen shrub or small tree. Red berries prolifically borne on pistillate plants. Drought-resistant. Occasionally used for clipped hedges. 22.

Selected Form: **'Nana'.** NE, 1, 29, 40.

Sweet Bay, Laurel

Laurus nobilis (6B)
Tall shrub with aromatic evergreen leaves, 3-4 in. long. Shears well and is sometimes grown as a tub plant. Dies back to the ground in New York City each winter but is root hardy if mulched. PT, 4, 18, 29.

Privet

Ligustrum amurense (4-3B)
Amur Privet
Pyramidal shrub to 10 ft. or more. Widely used as a hedge in northern areas where the similar California privet is not reliably hardy. All of the common privets are tolerant of a wide range of growing conditions. BU, BT, CO, FO, IN, KE, KR, MA, MU, NE, SN, SP, WC, 1, 10, 19, 27, 29, 30, 38.*

Ligustrum ibolium (ovalifolium x obtusifolium) (4)
Vigorous upright shrub much like California privet but hardier. CO, CR, EI, LI, LT, SA, SH, SN, WE, 10, 19, 23, 27, 38.

Ligustrum japonicum (7)
Japanese Privet
Evergreen shrub to 8 ft. or more. Lustrous 4-in.-long deep green leaves with dark red margins. This and the similar *L. lucidum* are probably the finest privets, but they are tender in many parts of the country. 4, 18, 22, 29.

Selected Form: **'Rotundifolium' ('Coriaceum').** Round-leaf Privet. Slow-growing to about 6 ft. Thick coin-like leaves. EA, TL, 29.

Ligustrum lucidum (7)
Glossy Privet
Evergreen shrub to 10 ft. or more, sometimes a small tree. Shiny leaves up to 6-in. long. DA, EA, HA, WB, 12, 17, 19, 40.

Ligustrum ovalifolium (5)
California Privet
Familiar hedge shrub to 10 ft. or more. Shiny leaves sometimes persist into winter. A native of Japan despite the common name. North of New York City, Amur privet is more reliably hardy. Like most privets, it is tolerant of poor soil and shade. BT, CB, DA, EA, MU, RO, SQ, WB, 10, 17, 23, 27, 38.

Ligustrum sinense (6)
Chinese Privet
Tall shrub or small tree with attractive panicles of white flowers in early summer. WB, 10, 38.

For other **Privets,** *see page 72.*

Spice-bush

Lindera benzoin (Benzoin aestivale) (4)
Aromatic shrub to 8 ft. or more. Small yellow flowers in early spring. Useful for moist soils and naturalized areas. DU, EI, EM, FO, GA, GS, ML, WE, 19, 27, 38.

Honeysuckle

Lonicera maackii (2)
Amur Honeysuckle
Very large, often with spreading branches. Valued for long-lasting red fruits in autumn, an attraction to wild-life. A prolific seeder. White flowers fading to yellow, early summer. FO, LI, MU, SH, TL, VA, 14.

For other **Honeysuckles,** *see pages 43, 72.*

Mahonia

Mahonia bealei (6)
Leather-leaf Mahonia
Stiff evergreen shrub to 6 ft. or more. Coarse bluish-green compound leaves. Attractive small yellow flowers and conspicuous grape-like berries. Useful for foliage contrast. Shade. CB, DA, EA, KI, PT, WC, 1, 13, 16, 17, 18, 22, 27, 29, 39.

Mahonia pinnata (6)
Similar to *M. aquifolium* (see page 72), but eventually to 8 ft. or more. Duller, usually more numerous evergreen leaflets. Pale yellow flowers in clustered racemes. LI, SG, 10.

Bayberry

Myrica cerifera (6-5B)
Wax-myrtle
Evergreen shrub to 8 ft. or more; 2-3 in.-long aromatic leaves. Berries silvery gray. Dioecious. CB, 12, 17.

Myrica pensylvanica (2)
Northern Bayberry
Similar to the preceding, but deciduous and much hardier. Thrives in sandy soil. CB, DU, FO, LC, LT, OL, PW, RO, SA, SH, VI, WE, 1, 6, 11, 19, 27, 31, 32, 39.*

Heavenly-bamboo

Nandina domestica (7)
Stiffly upright shrub to 6-8 ft. with large clusters of bright red berries in autumn. Brilliant scarlet autumn color. Leaves retained through the year. DA, EA, KS, NE, PT, SI, TL, WB, 1, 4, 10, 12, 17, 18, 21, 22, 29, 33, 38, 40.
Selected Form: **'Compacta'.** To 3-4 ft. CB, PA, PT, SK, WA, WI, 18, 22, 33.

Osmanthus

Osmanthus fortunei (heterophyllus x fragrans) (7)
Vigorous evergreen shrub to 8 ft. or more. Small fragrant flowers in late spring; 3-4 in.-long holly-like leaves. TL, WB, 13.

Osmanthus heterophyllus (ilicifolius) (6)
Holly Osmanthus
Tall dense evergreen shrub with leaves remarkably similar to English holly, but arranged in pairs along the stem. Fragrant small flowers in late summer. DA, EA, PT, TL, WB, 12.
Selected Forms: **'Gulf Tide'.** Slow-growing, compact. CB, ML, TL, WA, 17, 22, 40.
'Rotundifolius'. Twisted, somewhat rounded, nearly spineless leaves. Slow-growing, perhaps to 4 ft. or more. EA, TL, WA.
Variegated-leaf forms: DA, 16, 22, 29.

Mock-orange

Philadelphus coronarius 'Aureus' (4)
Golden Mock-orange
To 5-6 ft., with leaves golden-yellow in spring. Full sun. CO, FE, FO, GU, HG, KR, KS, LC, MA, PV, RH, SH.

For other **Philadelphus** *see page 44.*

Photinia

Photinia fraseri (7)
Fraser Photinia
Vigorous tall evergreen shrub with reddish new growth through the summer. Large shiny leaves and attractive white flowers. Hybrid origin: *P. glabra* x *serrulata*. The form available is a cultivar, 'Birmingham', but it is known in the trade simply as Fraser photinia. Tips of shoots suffer winter injury in New York City, but these may be easily

pruned out in early spring. First-rate. HA, NE, PT, TL, WA, 1, 4, 10, 12, 18, 21, 22, 29, 33, 40.

Photinia glabra (7)
Japanese Photinia
Handsome evergreen shrub to 7-8 ft. with shiny leaves 3-4 in. long; 4-in.-wide flower clusters in mid-spring. Red berries in autumn. 12, 33.

Photinia serrulata (7)
Chinese Photinia
Attractive tall shrub or small tree with lustrous evergreen leaves. White flowers in 6-in. heads. Red berries in autumn. ML, PT, TL, 4, 22, 29.

Photinia villosa (5-4B)
Oriental Photinia
Spreading deciduous shrub to 8-10 ft. with generally good red or orange-yellow autumn color and persistent red berries. Moderately attractive white flowers in mid-May. DU, FO, LI, ML, TL, 6, 27.

Eastern Ninebark

Physocarpus opulifolius (3-2B)
Vigorous shrub to 8 ft. or more with small maple-like leaves. Leggy. Conspicuous clusters of small white flowers in late May, followed by decorative red seed pods. Peeling bark. FO, MA.
Selected Forms: **'Luteus' ('Aureus').** Golden Ninebark. Leaves bright yellow in spring. Full sun. AE, BA, FE, FO, KS, LC, MB, PN, PV, RH, SH, 10, 38.
'Nanus'. Dwarf Ninebark. Dense, to 4-5 ft. More refined than the species. BA, FE, FO, GU, KS, LC, MA, ML, PV, RH, 10, 30, 38.

Trifoliate-orange

Poncirus (Citrus) trifoliata (6-5B)
Handsome, dense, thorny shrub with green twigs in youth; small open tree with picturesque smooth brown bark at maturity. Small waxy leaves. Two-in.-wide white flowers in April. Small oranges, first cousins to the true orange, are colorful in autumn, but suitable only for marmalade. Minor twig damage occurs in Long Island in a severe winter. A satisfactory hedge southwards. DU, PA, TL, 12, 17.

Cherry, Cherry-laurel, Plum

Prunus cistena (2)
Purple-leaf Sand Cherry
Shrub to 6-7 ft. with purplish-red leaves. Small white flowers in early May. Purplish-black fruit. BA, FA, FE, FO, GI, GU, KS, LC, MA, PN, PV, RH, SH, ST, WC, 1, 6, 15, 30, 33.*

Prunus laurocerasus (6)
Cherry-laurel
Shrub to about 10 ft. with lustrous evergreen leaves. Racemes of white flowers in mid-May. PT, VI, 13, 22, 29, 33, 40.
Selected Forms: **'Otto Luyken'.** To about 3 ft.; twice as broad. CB, JA, ML, WA, 22, 33.
'Schipkaensis'. (5-4B). Dense, to 5 ft. or more, usually broader than tall. Five-in.-long shiny leaves. DA, FO, TL, WB, WE, 2, 10, 12, 17, 26, 33.
'Zabeliana'. Small leaves. ML, 22, 33.

Prunus maritima (3)
Beach Plum
Spreading shrub to 6 ft. with handsome white flowers in late April. Small edible plums in late summer. Satisfactory under inland as well as coastal conditions. CR, DU, FO, KE, RO, TL, VI, 1, 11, 14, 19, 27, 32.

For other **Prunus** *see pages 16, 26, 44, 73.*

Firethorn, Pyracantha

Pyracantha atlantioides 'Aurea' (6)
Gibbs Yellow Firethorn
Similar to *P. coccinea* forms, but taller. Birds ignore the yellow berries which remain attractive until late autumn. Half-evergreen. HH, 17, 27.

Pyracantha coccinea (6)
Scarlet Firethorn
Strong-growing, semi-evergreen shrub to 8 ft. or more. Attractive small white flower clusters in late May or early June. Numerous red or reddish-orange berries in autumn. Birds quickly devour the ripened berries of some firethorns while ignoring others. Evergreen southwards. Frequently espaliered. Beginner's bonsai. The species is usually sold in its forms.
Selected Forms: **'Kasan'.** Hardy in Zone 5. Fruits orange-red. BU, CO, CR, GU, HG, IN, LC, LI, SA, 22, 29, 33, 39.
'Lalandei'. More-or-less hardy in Zone 5. Vigorous, almost rank grower to 8-10 ft. Fruits scarlet-red. CB, CO, FO, GI, KE, LC, LE, LT, NE, SP, WB, WF, 1, 11, 17, 19, 22, 27, 33, 40.*
'Lowboy'. To 3-5 ft. SH, 1, 9, 12, 17, 19, 22, 27, 32, 39.

Pyracantha 'Mohave' (koidzumii x coccinea) (6)
Upright evergreen or semi-evergreen shrub to about 8 ft. Resistant to fireblight and scab. Persistent orange-red fruits spurned by birds. ML, NE, SH, SN, WC, 1, 2, 11, 12, 22.

Other **Pyracantha** *species and forms: 1, 2, 5, 8, 29, 32, 33, 39, 40.*

Buckthorn

Rhamnus cathartica (3)
Common Buckthorn
Vigorous shrub to 10-12 ft., often a small tree at maturity. Lustrous foliage. Although not a first-rate ornamental, buckthorn may be useful in conservation plantings because of its black berries, a source of wild-life food. FO, MA, VA.

Rhamnus frangula 'Columnaris' (3)
Tall-hedge Buckthorn
Vigorous narrow columnar shrub to 12 ft. or more, useful for hedges. Shiny green leaves. BA, FE, KE, KR, KS, LT, MA, MU, PV, SN, SP, WC, WE, 1, 6, 11, 15, 19, 27, 33.

Sumac

Rhus aromatica. See page 75.

Rhus copallina (5-4B)
Shining Sumac
Tall shrub or small tree with lustrous deep green leaves with winged midribs. Scarlet autumn color and crimson fruits. Less coarse than the following two species. DU, GA, GS, HG, LC, ML, 10, 19, 38.

Rhus glabra (3)
Smooth Sumac
Shrub to 8-10 ft. with leaves bright red in autumn. Fruits scarlet. BA, FO, GS, KS, LC, LI, MA, MU, PV, 10, 12, 19, 27, 30, 38.

Rhus typhina (3-2B)
Staghorn Sumac
Sparsely branched open shrub or a small tree to 10 ft. or more. Velvety twigs. Clump-forming, like the preceding two. Brilliant orange-scarlet autumn color. Seeds eaten by wild-life. DU, FE, FO, GA, KS, LC, MA, SH, SN, WE, 12, 27, 30, 33, 38.
Selected Form: **'Laciniata'.** Cut-leaf Sumac. Very graceful. BA, CO, FA, FO, GU, HG, LC, MA, PV, RH, SH, WC, WE, 6, 15, 16, 30, 33, 38.

Alpine Currant

Ribes alpinum (3-2B)
Compact shrub to 5-6 ft. with refined small maple-like leaves. Useful for hedges in cold climates. Many currants serve as alternate hosts for white pine blister rust and should not be planted where 5-needle pines are common. The staminate form of *R. alpinum* is reportedly immune. BA, CO, EM, FA, FE, FO, GU, HG, KR, KS, LC, MA, PN, PV, RH, VA, WC, 1, 15, 30.*

For other **Currants** *see page 47.*

Rose

Rosa rubrifolia (3)
Red-leaf Rose
Shrub to about 5 ft. with dark red flowers in late May. Dull reddish-green foliage. KS, TI.

For other **Roses** *see pages 47, 75.*

Willow

Salix elaeagnos (incana) (4)
Rosemary Willow
Handsome large spreading shrub with foliage silvery from a distance. Similar to Russian-olive but the leaves are narrower. ML.

Salix purpurea (4-3B)
Purple Osier
Spreading shrub to 10 ft. or more. Purplish twigs. Leaves bluish beneath. WE, 19.

Salix sachalinensis 'Sekka'' (4)
Fan-tail Willow
Sprawling tall shrub with twisted and often flattened (fasciated) twigs. An occasional hard pruning encourages twig character. Useful in winter floral arrangements. A curiosity. HA, IN, LC, ML, SH, WE, 23, 32.

For other **Willows** *see pages 17, 47, 75.*

Elder

Sambucus canadensis (3)
American Elder
Loose vigorous suckering shrub to 10-12 ft., with coarse compound leaves. Showy flat cymes of white flowers in early summer, followed by edible purplish-black berries. Mainly for wet sites or for wild-life plantings. FO, LC, MA, VA, WE, 38.
Selected Forms: **'Acutiloba'.** Cut-leaved. DU, MA.
'Aurea'. Yellow leaves. AE, BA, CO, FO, GU, KS, LC, LI, MA, PN, PV, SP, VA, WE, 23.

Sambucus pubens (3-2B)
American Red Elder
Shrub to about 8 ft. with dome-shaped white flower clusters in early spring and attractive red berries in early summer. Otherwise similar to *S. canadensis.* SJ, PN.

Buffalo-berry

Shepherdia argentea (3-2B)
Tall spiny shrub with silvery leaves and twigs. Edible scarlet berries in late summer. Dioecious. Tolerant of poor, dry soil and sometimes used as a hedge in colder areas. AE, BA, FA, FO, GU, LC, MA, PN, PV, SH, VA.

Shepherdia canadensis (2)
Russet Buffalo-berry
Thornless open-branched shrub to 5-6 ft. with gray-green leaves. Sweet yellowish-red berries in early summer. Dioecious. Tolerant of dry and alkaline soils. FO, VA.

The tiny yellow flowers of leather-leaf mahonia *(m. bealei)* offer a rich contrast to the stiff shiny blue-green leaves.

Snowberry

Symphoricarpos chenaultii (microphyllus x orbiculatus) (5)
CHENAULT CORALBERRY
Suckering shrub to 3-4 ft. with small leaves. Small red berries, whitish beneath. Useful as a bank cover or in a wild-life planting. CO, DA, FA, FO, GI, KE, LC, MA, RO, ST, WE, 27, 30, 38.
Selected Form: **'Hancock'.** Dwarf spreading shrub suitable for a rough ground cover on dry banks. CH, DU, FO, KS, LI, SH.

Symphoricarpos 'Mother of Pearl' (4?)
To 4-5 ft. Large light pink berries. A hybrid of snowberry and coralberry. WE.

Symphoricarpos orbiculatus (vulgaris) (3)
INDIAN CURRANT, CORALBERRY
Similar to *S. chenaultii.* Berries purplish-red, smaller. Suckering. Bank cover. BA, DU, EI, FO, KS, LT, MA, PV, RH, SH, SP, 10, 11, 12, 19, 27, 30, 38.

Symphoricarpos rivularis (albus laevigatus) (3)
SNOWBERRY
Shrub to 5-6 ft. with attractive ½-in.-wide white berries in late summer and autumn. Suckering. Flowers not showy. Invariably sold as *S. albus.* BA, CB, DU, FO, GI, GU, KE, KS, MA, PV, RH, SG, SH, WE, 11, 19, 27, 30, 37, 38.

Asiatic Sweetleaf

Symplocos paniculata (5)
Tall shrub or small tree with small clusters of fragrant white flowers in mid-May. Handsome sapphire-blue berries in early autumn which unfortunately do not last long. CB, DA, DU, RO, TL.

High-bush Blueberry

Vaccinium corymbosum (4-3B)
Dense twiggy shrub growing slowly to 8 ft. Dainty heath-like white flowers in May. Orange-scarlet autumn color. Acid soil. Many forms cultivated for fruit. GA, LC, LT, VI, WE, 11, 19, 27, 32.

Viburnum

Viburnum acerifolium (3)
MAPLE-LEAF VIBURNUM
Loose shrub to 4-5 ft. Crimson autumn color and black berries. For a shady spot in the naturalized garden. Except for snowball forms, most viburnums are good wild-life shrubs because of their berries. They generally have good dark red autumn foliage. FO, GS, WE, 27.

Viburnum alnifolium (3)
HOBBLE-BUSH VIBURNUM
Broad suckering shrub to 8 ft. or more. Large rounded leaves. Flat white flower clusters surrounded by conspicuous sterile florets in early spring. Berries red, finally black. Useful in moist parts of a northern woodland garden. DU, GA, GS.

Viburnum cassinoides (2)
WITHE-ROD VIBURNUM
Shrub to 6 ft. with clusters of white flowers in late May. Berries changing from yellow to red and black. Good in a naturalized garden. As with other shrubs, best fruit production is likely to occur when several plants of the same species are planted together. DU, GA, GS, LC, SQ, 11, 19.

Viburnum dentatum (3-2B)
ARROW-WOOD VIBURNUM
Leggy shrub to 10 ft. or more. Glossy roughly cut leaves. Conspicuous flat clusters of white flowers in late May. Blue-black berries in autumn. Shade-tolerant. BA, DU, FE, FO, KE, LT, MA, PV, RH, RO, SA, SH, VI, 1, 11, 15, 19, 27, 30, 38.*

Viburnum dilatatum (5)
LINDEN VIBURNUM
Dense shrub to 5-6 ft. Notable for its clusters of red berries that last into winter. One of

the most fruitful viburnums, but rather variable. CB, DA, FO, HG, LC, LI, RO, SA, SN, SQ, TL, WE, 1, 6, 9, 11, 14, 19, 27, 39.

Viburnum ichangense (6)
Ichang Viburnum
Shrub to 5 ft. with bright red berries in clusters along the branches. DA, TL.

Viburnum japonicum (7)
Evergreen shrub to about 5 ft. Glossy dark green leaves sometimes 6-in. long. Fragrant white flowers in spring. Bright red berries. PT, 4, 18, 22, 29, 40.

Viburnum lantana (4-3B)
Wayfaring-tree
Tall open shrub with somewhat coarse foliage. Clusters of white flowers in early May. Berries change from red to black. BA, DU, FA, FO, HG, KS, LC, MA, PV, SA, SH, SP, VA, 1, 11, 15, 19, 27, 29.

Viburnum lentago (3-2B)
Nanny-berry
Vigorous tall spreading shrub with clusters of white flowers in mid-May. Berries change from red to black in autumn. Useful in a naturalized area. BA, DU, FO, KS, LC, MA, PN, PV, SA, SH, SP, VA, 1, 2, 6, 11, 12, 19, 27, 30.*

Viburnum opulus (3)
European Cranberry-bush
Stout open-growing viburnum to 8 ft. or more. Flat clusters of small white fertile flowers, surrounded by conspicuous sterile florets, mid-May. Red berries often retained late in the season. Plant lice frequently disfigure the leaves of this species. BA, CO, EI, HG, LC, NE, PV, RH, SH, SN, VI, 2, 11, 27, 30, 38, 39.
Selected Forms: **'Compactum'.** Dense, to 5 ft. or more. A fruiting form, not to be confused with 'Nanum' (see page 76). CB, FE, HG, LC, SA, SH, SP, VA, WC, 1, 2, 6, 15, 16, 30.
'Xanthocarpum'. Berries yellow. CH, FO, LC, WC.

Viburnum prunifolium (4)
Black-haw Viburnum
Shrub to 10-12 ft. or small rounded tree. Small leathery leaves with deep purple or red autumn color. Berries turn from yellow to black. One of the best tall viburnums. BA, DU, EI, FO, HG, LC, LI, PV, RO, SA, WE, 1, 6, 9, 17, 19, 27.

Viburnum rhytidophylloides 'Willowwood' (lantana x rhytidophyllum) (5)
Large dense shrub with rough, long leaves held late in autumn. Flat clusters of white flowers in spring, again in autumn. HE, NE, SA, TL, WE, 10, 26.

Viburnum rhytidophyllum (6-5B)
Leather-leaf Viburnum
Broad dense evergreen shrub to 6 ft. or more. Long rough leaves. White flower clusters in late spring. Foliage retained in best condition Philadelphia southwards. DA, EI, FO, HG, LI, NE, SP, SQ, WB, WE, 9, 10, 11, 12, 17, 26, 27, 33, 39.

Viburnum setigerum (theiferum) (5)
Tea Viburnum
Long-stemmed shrub to 8 ft. or more. Profuse red berries in autumn. DA, FO, LI, PW, RO, TL, WC, WE, 2, 9, 11, 12, 14, 17, 19, 27, 39.
Selected Form: **'Aurantiacum'.** Orange berries. HG.

Viburnum tinus (8-7)
Laurestine
Dense evergreen shrub to 10 ft. or more. Glossy dark leaves. Pinkish-white flowers in late winter or early spring. Makes a handsome hedge.
Selected Forms: **'Nanum'.** To about 4 ft. 22, 33.
'Robustum'. PT, 4, 22, 29, 33.

Viburnum trilobum (americanum) (3-2B)
American Highbush-cranberry
Sometimes considered a botanical variety of *V. opulus,* which it closely resembles. Fruits edible. Useful in a wild-life planting. BA, BU, DU, FE, GI, KE, KR, KS, MA, PV, RO, SH, VA, 1, 2, 11, 15, 19, 27, 30.*

Viburnum wrightii (5)
Wright Viburnum
Rather refined shrub to 6 ft. or more. Numerous red berries in autumn. A form of *V. dilatatum* with very pubescent leaves is sometimes sold as *V. wrightii,* but the latter species has nearly glabrous leaves. CB, EA, EI, FO, HG, KE, LC, LI, NE, PW, RO, SP, SQ, WC, WE, 1, 2, 11, 14, 19.
Selected Form: **'Hessei'.** To 4 ft. KI.

For other **Viburnum** *see pages 52, 76.*

Weigela

Weigela 'Foliis Purpuriis' ('Java Red', 'Purpurea') (5)
Purple-leaf Weigela
Shrub to 4 ft. with dull purplish-green leaves. Pink flowers in spring. CR, MB, SH, SP, 2, 10, 22, 23, 38.

Weigela 'Nana Variegata' (5)
To about 3 ft. Variegated foliage. Needs little pruning. CO, FO, ML, WE, 2, 10, 11, 19, 30, 38.

Weigela 'Variegata' (5)
To about 4 ft. Golden variegated leaves. Flowers deep rose. KE, MB, PT, PV, SH, 1.

For other **Weigela** *see page 53.*

DWARF OR LOW-GROWING SHRUBS

Deciduous and Broadleaf-evergreen

(Deciduous unless otherwise noted)

Abelia

Abelia 'Edward Goucher' (grandiflora x schumannii) (7-6B)
Mounded shrub to 2-3 ft. Small trumpet-shaped flowers in summer. Magenta. Leaves retained late in autumn in New York. EA, PT, SI, TL, 1, 4, 10, 13, 17, 18, 22, 29, 33.

Abelia grandiflora (chinensis x uniflora) (6-5B)
Glossy Abelia
Mounded shrub to 3-4 ft. in the North, twice that in the South. Refined, small leaves retained late into autumn. Attractive, although not showy, white-to-pink flowers through summer. Has the longest flowering season of any shrub hardy in New York. CB, DA, EA, EI, HA, HG, PT, TL, WB, WC, 1, 11, 12, 13, 17, 19, 22, 27, 33, 38.*
Selected Forms: **'Nana' ('Prostrata').** To 2 ft. Nearly prostrate. Ground cover. 21, 22. **U.S.D.A. #210092.** Rose-pink flowers. 39.

Abelia schumannii (7)
Mounded shrub to 3-4 ft. with semi-evergreen leaves. Lavender-pink flowers in summer. AL, MN, WB.

Abelia-leaf

Abeliophyllum distichum (5-4B)
Dense shrub to 3-4 ft. with white forsythia-like flowers in early April. Flower buds may be susceptible to late frosts in cold areas. Slow-growing. Sometimes difficult to establish. CB, CH, DA, LI, ML, WF, 16, 41.

Andromeda, Bog-rosemary

Andromeda glaucophylla (2)
Downy Andromeda
Shrublet to 6-8 in. with stiff, twiggy stems. Bluish evergreen leaves. Light pink flowers in May. Needs moist, acid soil. HH, ML, RG, 8.

Andromeda polifolia 'Nana' (2)
Dwarf Bog-rosemary
Dense mound to 10-12 in. with narrow gray-green evergreen leaves. Attractive pink flowers in May. AL, HO, JA, KI, OL, RG, SI, SK, TA, WA, 25.

Bear-berry

Arctostaphylos uva-ursi (2)
Dense trailing ground cover to 1 ft. Small dark evergreen leaves. Tiny white flowers in May. Red berries. Needs acid, sandy soil. CR, HH, LE, OL, PT, RG, SG, SH, SI, VA, VI, WE, YB, 8, 19, 22, 33.

Barberry

Berberis buxifolia 'Nana' (6-5B)
Dwarf Magellan Barberry
Dense evergreen shrub to 18 in. Small leaves. Seldom flowers. Of interest as one of the few woody plants of the southern hemisphere hardy in the northern U.S. ML, RG, SK, 33.

Berberis darwinii (7)
Darwin Barberry
Handsome evergreen shrub generally growing to only 3 ft. in the U.S. Leaves small, holly-like, turning purple in autumn. Rather conspicuous orange-to-yellow flowers in early spring. 21, 33.

Berberis stenophylla 'Irwinii' (darwinii x empetrifolia) (5)
Rosemary Barberry Form
Spreading low evergreen or semi-evergreen shrub to about 3 ft. in the North, taller in the South. Small slender leaves. Abundant yellow flowers in spring. RG, 24.

Berberis thunbergii 'Crimson Pygmy' ('Atropurpurea Nana') (5-4B)
Crimson Pygmy Barberry
Handsome compact shrub to 2 ft. with dark red leaves. Broader than tall. Good low hedge. BA, GU, IN, KE, KS, LE, NE, PV, SA, SP, WC, 1, 2, 11, 15, 19, 30, 33, 39.*

Berberis triacanthophora (5)
Three-spine Barberry
Handsome evergreen shrub to 3-4 ft. Slender 2-in.-long leaves. 17, 27, 33.

Berberis verruculosa (6-5B)
Warty Barberry
Mounded evergreen shrub to 3-4 ft. Lustrous leaves, white beneath, are 1-in. long. Most barberries have graceful small yellow flowers in spring, but the flowers of this species are especially nice. DA, RO, WA, WB, 11, 17, 33, 39.

For other **Barberries** *see page 54.*

Dwarf Birch

Betula nana (2)
Low, spreading, twiggy shrub to 2 ft. Leaves small, often rounded. Deciduous. AL, HO, MN, SK.

Spike-heath

Bruckenthalia spiculifolia (5)
Spreading evergreen shrublet to 10-12 in. Pale pink flower spikes in May-June. Heather relative, with the same cultural requirements. HH, ML, PA, WE, 8.

Boxwood

Buxus microphylla 'Compacta' (5)
Kingsville Dwarf Box
Exceptionally dense, slow-growing shrub to about 18 in. Small leaves. Bonsai candidate. EA, OL, PA, RO, SK, SL, TA, TL, WA, 39.

Buxus microphylla koreana (4)
Korean Box
Spreading, somewhat loose, evergreen shrub to 1½-2 ft. tall. Winter foliage not as attractive as in *B. sempervirens*. CO, FO, G1, GU, MU, NE, PA, RO, SH, TL, VA, WC, WE, 5, 6, 11, 19, 25, 38.*
Selected Form: **'Wintergreen'.** LC, SN, WE, 1, 6, 15, 23, 36, 38.
Other Forms: **Var. japonica (6-5B).** Japanese Box. Compact evergreen shrub to 5 ft. with spreading branches and slightly larger leaves than in the species. DA, EA, OL, PT, RO, TA, TL, 1, 22, 29, 40.
Var. sinica (harlandii of gardens**) (6).** Chinese Box. Handsome shrub to 2 ft. with narrow, closely set leaves. EA, TL, 13, 29.

Buxus sempervirens 'Suffruticosa' (5)
Edging Box
Small-leaved dense evergreen shrub to 2-2½ ft. Often used as a miniature clipped hedge or edging plant. DA, EA, L1, RO, TL, WA, WB, WE, 11, 19, 20, 33, 39, 42.

Buxus sempervirens 'Welleri' (5)
Common Box, Weller Form
Dense evergreen mound to 4 ft. after many years. Broader than tall at maturity. Foliage attractive through winter. More satisfactory in the North than other forms of common box. CR, WF.

For other **Boxwood** *see page 55.*

Heather

Calluna vulgaris (4)
Valuable small rock garden shrubs with small evergreen leaves and flowers ranging from white to pink and purple. Long flowering period, beginning in July. Although there is only one species, it is highly variable. Usually less than 1 ft. in gardens. Best results in acid soil of modest fertility. Soil should retain moisture but be well-drained. Full sun. Provide loose cover of evergreen boughs for winter protection from Philadelphia northwards. Substantial pruning, if needed, should be restricted to early spring.
Many named forms. A few of the better ones: **'Else Frye'.** Low, semi-prostrate. Foliage vivid green. Double white flowers. AL, CR, HH, ML, MN, RG.
'Foxii Nana'. Mound to only 4-in. high. Flowers purple. AL, HH, MN, RG, SK, WF, 8.
'H.E. Beale'. Flowering sprays to 18-in. long. Fairly large shell-pink flowers. ML, MN, SP, WC, WE, WF, 33.
'J.H. Hamilton'. Spreading cushion. Bright pink double flowers. HH, MN, RG, WC, WF, 8, 32, 33.
'Juno'. Thick mound of arching stems. 8-12 in. tall. Lavender flowers. ML.
'Mrs. Pat'. Spring growth bright pink. Flowers purple. HH, MN, RG, WF, 8.
'Pygmaea'. Dwarf, forming mats. Excellent foliage. Purple flowers. AL, MN.
'Ronald Gray'. Prostrate. Lavender flowers on lateral spikes. AL, HH, ML, MN, RG, WF, 8.
'Tib'. Thin open mound. Flowers dark purple, double. HH, ML, MN, RG, SP, TL, WF, 8.
'Valorian'. Hybrid of 'R.H. Gray' and 'Foxii Nana'. Handsome slow-growing mat. Deep lavender flowers, rather sparse. RG, 21.
Other Forms: ML, RG, OL, TL, WF, 8.

Bluebeard

Caryopteris clandonensis 'Blue Mist' (incana x mongholica) (5)
Shrub to 4 ft. with light blue flowers in late summer. Prune back to the ground in early spring. CO, CR, FA, FE, GU, JA, KE, KS, LE, NE, RO, SP, SQ, WF, 11, 30.
Other Form: **'Dark Knight'.** Flowers purple. CB, LE.

Cassiope

Cassiope lycopodioides (2)
Evergreen mat to 6-8 in. Leaves scale-like. A heather relative with white bellshaped flowers in April. Moist, acid soil. ML, MN, WA.

Sweet-fern

Comptonia peregrina (2)
Woody plant, to 3 ft., with aromatic fern-like foliage. Flowers inconspicuous. Good for dry banks. Should be cut back sharply when transplanted. DU, GA, L1, 19.

Dogwood

Cornus florida 'Pygmy' (5?)
Dwarf Flowering Dogwood

Arthur N. Orans

Mounding and cascading over a wall, small-leaved cotoneasters contrast handsomely with the stones and the polished gravel lawn.

Dense low-growing form, perhaps to 4 or 5 ft. Modest white bracts in early or mid-May. CB, KI, ML, WA, 14.

Cornus sericea 'Kelseyi' (3)
Kelsey Shrubby Dogwood
Dense shrub to 2 ft., occasionally used as a rough ground cover. *C. sericea* commonly listed in catalogs as *C. stolonifera*. FO, HG, LC, ML, 2, 23.

Cotoneaster

Cotoneaster adpressus (4-3B)
Prostrate deciduous shrub with rooting stems. Small pink flowers in May. Bright red berries in autumn. CH, SQ, WE, 6.
Selected Forms: **Var. praecox.** Early Cotoneaster. Dome-shaped to 1½-2 ft. Small dark green leaves turn red before dropping in autumn. Persistent berries. CB, CR, DA, FO, LI, MU, RO, SP, WE, 8, 9, 11, 19, 20, 25, 27, 32, 36.
'Tom Thumb'. Compact shrublet to 8-10 in., hardly creeping. Small leaves. Red berries. Bonsai. PA, RG, TA, 32, 36.

Cotoneaster apiculatus (4)
Cranberry Cotoneaster
Deciduous shrub to 3 ft. with horizontally spreading branches. Small shiny deep green leaves. Showy relatively large berries in autumn. BA, DU, KS, LA, LT, PV, PW, SA, SH, SI, SP, WC, 1, 2, 11, 15, 16, 22, 27, 39.*

Cotoneaster congestus (microphyllus glacialis) (6)
Pyrenees Cotoneaster
Exceptionally dense mound to 3 ft. Evergreen. Bright red berries in autumn. AL, HO, OL, 1, 17, 18, 22.

Cotoneaster conspicuus decorus (6)
Necklace Cotoneaster
Prostrate shrub with handsome small glossy leaves. Evergreen. Small scarlet berries. Ground cover. PT, 2.

Cotoneaster dammeri (4)
Bearberry Cotoneaster
Prostrate shrub to 1 ft. with long trailing branches. Leaves evergreen, 1-in. long. Variable. Bright red berries. Ground cover. CO, RO, SH, SI, WE, 8, 11, 19, 25, 32, 33.
Selected Form: **'Skogsholmen'.** Small-leaved shrub to 15-in. tall. Vigorously spreading. Profuse white flowers in May. Ground cover or accent plant. Semi-evergreen on Long Island. Choice. CH, DA, HH, LI, RO, SH, SQ, TL, 9, 14, 17, 19, 20, 25, 27, 36, 39.

Cotoneaster 'Herbstfeuer'. (dammeri x salicifolius) (6)
Prostrate shrub with lustrous, leathery, willow-like leaves. Brilliant red autumn color. CB, DA, RO, 19, 21, 27, 36, 39.

Cotoneaster horizontalis (4)
Rockspray Cotoneaster
Horizontally spreading shrub, 2-3 ft. tall. Branching resembles a fish skeleton. Brilliant orange foliage in autumn. More-or-less evergreen in the South. Red berries. Handsome. GI, GU, HO, LA, LT, PA, PT, SA, SH, SP, WB, WC, 1, 11, 12, 17, 19, 22, 27, 33.*
Selected Forms: **'Little Gem'.** Prostrate, to

6-in. tall. No fruits. OL, 2, 25.

'Variegata'. Leaves edged silver. HO, OL, PA, SL, WA, 25, 32.

Cotoneaster microphyllus (6-5B)
Small-leaf Cotoneaster
Dense mound to 2-2½ ft. Half-inch-long evergreen leaves. Needs more pruning than other forms to keep a good habit. Scarlet berries. Most of the low-growing cotoneasters are bonsai candidates, but this one especially so because of its small leaves. AL, TL, 18, 33.

Selected Forms: **'Cooperi'.** Trailing, forming a low mound. Slow-growing. HO, PA, WA, 21, 36.

'Thymifolius'. The smallest-leaved cotoneaster. Distinctive, but it does not tolerate the winters of New York City very well. AL, RG, SP, 11, 16, 22, 36.

For other **Cotoneasters** *see pages 40, 56.*

Broom

Cytisus decumbens (5-4B)
Prostrate broom to 8-in. tall. Bright yellow pea-like flowers in May-June. Makes an interesting ground cover. As with all *Cytisus*, provide full sun and sharp drainage. Sometimes listed under *Genista*. AL, HH, OL, PA, RG, WA, 8.

Cytisus kewensis (ardoinii x albus) (6)
Kew Broom
Mat 6-8 in. high. Very pale yellow flowers in early May. Pea-like. AL, MN, 33.

Cytisus purgans (5)
Provence Broom
Dense shrub to 2-3 ft. with stiff upright branches. Deep yellow flowers in early May. SH, 16, 33.

Cytisus purpureus (4)
Shrub to 1½ ft. with arching stems and clover-like leaves. Purple flowers in early May. ML, OL.

For other **Cytisus** *see page 40.*

Irish-heath

Daboecia cantabrica (5)
Dense shrub to 1-1½ ft. Evergreen. Tiny purple bell-shaped flowers through much of the summer. Heath relative. ML, 8.

Daphne

Daphne blagayana (6-5B)
Semi-prostrate evergreen shrub to 8-in. high. Creamy-white flowers in early spring. Fragrant. WI.

Daphne burkwoodii 'Somerset' (caucasica x cneorum) (4-3B)
Round shrub to about 3 ft. Semi-evergreen in the North. Fragrant whitish-pink flowers in mid-spring. Somewhat broader than tall. More vigorous and less temperamental than other daphnes. CB, LL, ML, SH, WC, WF, 16, 33.

Daphne burkwoodii 'Carol Mackie' (4-3B)
Similar to above but with white leaf margins. OL, PA, RO, SL, WA, 8.

Daphne cneorum (3)
Rose Daphne
Grayish evergreen mound to about 10-in. high. Covered with small bright pink flowers in early May. Fragrant. Sometimes short-lived. CB, CO, EI, KI, OL, RO, WE, 8, 33.

Selected Form: **'Ruby Glow'.** Foliage green. Flowers deep pink. LE, SK, WA, WC, WE, 21.

Daphne collina (7-6B)
Dense evergreen shrub to 2-2½ ft. Dark green leaves. Fragrant rose-purple flowers in June. SK.

Daphne genkwa (6-5B)
Lilac Daphne
Upright shrub to 3 ft. with scentless lilac-colored flowers in April. 39.

Daphne mezereum (4-3B)
February Daphne
Upright shrub to 3 ft. with clusters of lilac-purple flowers in very early spring. Attractive but toxic red berries. Since it is rather difficult to transplant, best obtain container-grown plant. Not always easy to establish. JA, LC, SH.

Daphne odora (7)
Evergreen shrub to about 4 ft. Intensely fragrant rose-purple flowers in late winter or very early spring. HH, LL, 16, 33, 39.

Selected Form: **'Marginata'.** Leaves bordered white. LL, PT.

Daphne retusa (6-5B)
Dense evergreen shrub to 2-2½ ft. Shiny green leaves. Fragrant white flowers tinged rose. Late April or early May. AL, MN, SK, WA.

Bush-honeysuckle

Diervilla lonicera (trifida) (3)
Northern Bush-honeysuckle
Open shrub to 3 ft. with lustrous green leaves. Small greenish-yellow funnel-shaped flowers in June. Useful for bank plantings or for a moderately shady spot. FO, GA, JA.

Diervilla sessilifolia (4)
Southern Bush-honeysuckle
Suckering shrub to 4 ft. tall. Shiny foliage most effective in late spring. Rather attractive, small, deep yellow flowers in June. Bank cover. GA, WB, 19, 27, 38.

Arthur N. Orans

Heathers and heaths come in many sizes and growth habits but they all have in common the delicate little bell-shaped flowers.

Elsholtzia

Elsholtzia stauntonii (4)
Mint-family shrub to 4 ft. Lilac-purple flower spikes in late summer. While the wood is fully hardy on Long Island, the shrub may be treated as a die-back in colder areas. JA, LE, WI.

Enkianthus

Enkianthus perulatus 'Compactus' (5)
Tight mound growing 1 ft. tall in 10 years. Flowers, not lavishly produced, are small white bells. Early May. SL.

For other **Enkianthus** *see p. 40.*

Trailing-arbutus

Epigaea repens (3)
Evergreen shrublet with trailing stems. Clusters of sweetly scented pink-to-white flowers in early April. Difficult to establish. Purchase pot-grown plants from commercial nurseries and set out in acid, humus-rich soil. CB, GA, HH, JA, SJ, WA, WE.

Heath

Erica species and forms
A very large genus of evergreen shrubs. Culture same as for heather *(Calluna).*

Erica carnea (5)
Usually 8-12 in. tall in the rock garden. The many forms are valued for their long flowering season, beginning in winter and continuing into spring. Flowers, like those of heather, are small and bell-shaped.

Selected Forms: **'King George'.** Crimson flowers. Sporadic bloom from December to early April in New York City. One of the best. AL, HH, LE, RG, WC, 8, 33.

'Ruby Glow'. Decumbent mound. Flowers ruby-red. AL, 8.

'Springwood Pink'. Fast-growing mat to 8 in. high. Deep pink flowers. HH, WC, WF, 8, 20, 33.

'Springwood White'. CB, HH, LE, WC, WE, WF, 8, 20, 33.

'Vivellii'. Reddish-green foliage. Tight grower. Dark red flowers. AL, HH, LE, RG, WA, WF, 8, 16, 33.

Erica cinerea form:
'C.D. Eason' (5). To 6 in. Bright red flowers in summer. HH, RG, WF, 8.

Erica tetralix 'Con Underwood' (3)
Gray-green foliage. Thin decumbent branches. To 9 in. Crimson flowers through much of the summer. AL, WF, 8.

Erica vagans (5) forms:
'Mrs. D.F. Maxwell'. Flowers cherry-red, summer. Upright, to 1 ft. AL, HH, SP, WF, 8, 33.

'Nana'. To 6 in. White flowers. Summer. 8.

Euonymus

Euonymus fortunei 'Carrieri' (5)
Glossy Winter Creeper
Loose evergreen shrub to 4 ft. with shiny dark green leaves. Climbing habit if supported. Fruit resembles bittersweet. WE, 29.

Euonymus fortunei 'Colorata' (4)
Trailing shrub to 1½-2 ft. high. Foliage, retained through the year, turns purple in winter. Ground cover. BA, FE, KR, KS, LA, LE, LT, MA, SA, SH, TL, WC, 1, 6, 10, 11, 13, 22, 27, 30.*

Euonymus fortunei radicans (5-4B)
Winter Creeper Euonymus
Trailing or climbing evergreen shrub with shiny dark green leaves. Of interest as the hardiest evergreen vine. Often listed simply as *Euonymus radicans.* Ground cover. CH, CR, FE, KE, LT, PT, SQ, WE, 11, 30.

Euonymus fortunei 'Sarcoxie' (5)
Upright shrub to 4 ft. with glossy green leaves. Retains its foliage over winter in better condition in northern areas than the species. FO, GI, IN, KE, KR, KS, MA, NE, PV, SH, SP, WC, WE, 5, 6, 10, 27, 29, 32, 38.*

Euonymus fortunei vegeta (5-4B)
Big-leaf Winter Creeper, Evergreen Bittersweet.
Spreading evergreen shrub to 4 ft. Dull green leaves. Profuse bittersweet-like fruit persists far into winter. Semi-evergreen in colder parts of the North. BA, BU, CH, CO, FO, GU, IN, KE, LC, MA, PV, PW, SA, SH, WC, WE, 5, 6, 15, 30.*

Euonymus nana turkestanica ('Koopmannii') (4-3B)
Fern-leaf Euonymus
Distinctive upright shrub to about 4 ft., 3-in.-long linear leaves. Evergreen in a mild winter in New York City; semi-evergreen northward. HG, VA.

For other **Euonymus** *see p. 57.*

Forsythia

Forsythia 'Arnold Dwarf' (5)
Shrub to 3-4 ft. Best kept to 1 ft. Given an occasional trimming, it makes a handsome bank cover. Refined foliage. Flowers sparsely. BA, CB, CH, LE, LT, MA, PV, SH, SP, WE, 1, 2, 6, 11, 15, 19, 30, 38.

Forsythia viridissima 'Bronxensis' (5)
Bronx Forsythia
Shrub to 1 ft. high, twice as broad. Leaves small. Numerous small yellow flowers in early April. Not a good ground cover since it is shy to root. CH, CO, FE, HG, IN, KI, KR, MA, PA, SK, TL, WE, 6, 9, 15, 19.

Fuchsia

Fuchsia procumbens (7)
Trailing shrublet to 3-in. high. Flowers blue and yellow, summer. Red berries. AL, MN.

Wintergreen

Gaultheria adenothrix (7-6B)
Trailing or creeping shrublet to 8-9 in. high. Pinkish-white flowers in June followed by red berries. Evergreen. AL.

Gaultheria nummularioides (7-6B)
Trailing evergreen shrublet to 4-in. high. Tiny leaves. Blue-black berries. AL, MN, SK.

Gaultheria procumbens (3)
Eastern Wintergreen
Creeping evergreen ground cover to 3-4 in. high. Tiny white bell-shaped flowers in early May. Red berries. Aromatic. Suitable as a small ground cover in the woodland garden. Popular terrarium plant. CB, GA, GR, HH, JA, OL, SJ, VI, WA, WC, WE, 8, 16, 32, 33.

Gaulthettya wisleyensis (6)
A low-growing bigeneric hybrid with handsome evergreen foliage. SK, WA.

Huckleberry

Gaylussacia brachycera (6)
Box Huckleberry
Spreading evergreen shrub to 1 ft. high. Small shiny green leaves. Ground cover. Acid soil. Handsome. OL, RG, PA, WA, 8.

Genista

Genista germanica (5)
Flat-topped shrub to 1 ft. Spiny. Bright yellow pea-like flowers in late May or early June. *Genista* is closely related to *Cytisus* (broom). They require rather poor sandy soil and sharp drainage to thrive. OL, RG, WA.

Genista lydia (hispanica lydia) (7)
Rock garden shrub to 2 ft. Bright yellow flowers in late May or early June. Rather showy. HH, ML, OL, WA, 8.

Genista pilosa (prostrata) (5-4B)
Prostrate shrub to 1 ft. high. Yellow flowers in mid-May. AL, HH, LE, ML, MN, OL, SK, WA, 8, 33.

Genista sagittalis (4-3B)
Completely prostrate. Yellow flowers borne on upright stems. Rather fast growing. AL, LE, OL, RG, 8.

Genista villarsii (5)
Shrublet to 6 in. Stems grayish-green. Bright yellow flowers in late spring. AL, MN.

Shrub-veronica

Hebe cupressoides 'Nana' (7)
Globe-shaped evergreen shrub to about 1 ft. Pale blue flowers in late spring or early summer. *Hebe* is often placed under *Veronica* in catalogs. Provide dry sandy soil. SK, WI.

Hebe decumbens (7)
Compact evergreen shrub to about 15 in. Gray-green leaves with red margins. White flowers on short spikes. May. RG, WA.

Hebe hectori (7)
Evergreen shrub to 2-2½ ft. Glossy light green leaves. Flowers white or pinkish. SK.

English Ivy

Hedera helix 'Conglomerata' (6)
Bunch-leaf Ivy
Distinctive shrubby form to 1-1½ ft. Small, closely set, two-ranked leaves on stiffly upright stems. ML, PA, RG, 19.

St. Johnswort

Hypericum calycinum (6)
Aaronsbeard Hypericum
Creeping shrub to 1 ft. high. Evergreen in the South. Yellow flowers over a long period in summer. Tolerates some shade, provided

The small shrubby St. Johnswort is characterized by showy flowers in various shades of yellow. It frequently blooms all summer.

J. Horace McFarland

soil is sandy. Ground cover. CB, LE, ML, PR, PT, WC.

Hypericum kalmianum (4)
Shrub to 3 ft. Bluish-green leaves. Bright yellow flowers, 1-in. across, appear in early summer. FE, FO, GU, LC, LI, SN, 1, 6, 30.

Hypericum moserianum (patulum x calycinum) (6-5B)
GOLD-FLOWER
Low shrub or loose ground cover with 2-2½ in.-wide yellow flowers over a long period in summer. Refined foliage. HA, PT, 4, 18.

Hypericum patulum henryi (6-5B)
HENRY ST. JOHNSWORT
Half-evergreen shrub to 2-3 ft. Spreading. 2-in.-wide golden-yellow flowers in summer. LE, ML, PT, 18.

Hypericum patulum 'Hidcote' (5)
Rounded shrub to 18 in. Yellow flowers most of the summer. Often herbaceous in the North. CR, DA, EI, EM, FO, HA, HG, JA, KE, LE, LI, LT, WC, WF, 1, 10, 11, 19, 27. *Other form:* **'Sungold'.** Similar to 'Hidcote' but reputedly a bit hardier. IN, SN, WC, 23.

Hypericum prolificum (4)
SHRUBBY ST. JOHNSWORT
Dense shrub to 3-4 ft. Fairly small bright yellow flowers in July. Shiny brown stems have winter character. DU, FO, GA.

Japanese Holly

Ilex crenata 'Dwarf Pagoda' (6)
Picturesque evergreen shrublet with tiny coin-like foliage. A pistillate form with black fruit. For rock garden or bonsai. An 8-year-old plant is 6 in. tall and 10 in. across. **'Green Dragon'**, which is staminate, grows to 2 ft. or more and is not as stable a cultivar. DI, HH, OL, SL, TL, 8, 25.

Ilex crenata 'Green Cushion' (6-5B)
Tight mound to 1 ft. or more. Glossy small evergreen leaves. Bonsai candidate. TL.

Ilex crenata 'Helleri' (6-5B)
HELLER JAPANESE HOLLY
Very slow-growing, compact, evergreen shrub to 3-3½ ft. Cushion-like. Small glossy dark green leaves. One of the best. Bonsai. CB, DA, NE, OL, RO, TL, WE, 8, 11, 12, 16, 17, 19, 21, 22, 25, 27, 29, 33, 40.

Ilex crenata 'Hetzii' (5)
HETZ JAPANESE HOLLY
Spreading low evergreen shrub to about 2½ ft. high. The convex leaves are fairly large for a Japanese holly. CR, DA, FO, GI, LI, MU, NE, RO, SQ, TL, WE, 5, 11, 13, 17, 19, 25, 27, 32, 38.*

Ilex crenata 'Mariesii' ('Nummularia') (6)
Very slow-growing upright evergreen shrub to 3 ft. or more. Picturesque short stiff branches. Small rounded coin-like leaves. Bonsai. BP, HO, MN, PA, RA, SL, TA, WA, 16.

Ilex crenata 'Stokes' ('Stokes Dwarf') (5?)
Similar to 'Helleri', but slightly flatter in growth. Reportedly a bit hardier. Bonsai. EI, HH, LI, PW, TL, VI, 19, 25, 32.

For other **Hollies** *see pages 29, 58.*

Kalmia (Laurel)

Kalmia angustifolia (2)
SHEEP LAUREL
Evergreen shrub to 3 ft. Clusters of rose-red flowers in early June. Requires moist, acid soil. AL, HH, OL, WA, 8.

Kalmia polifolia microphylla (3)
Semi-prostrate evergreen shrub to 1 ft. Narrow leaves. Conspicuous lavender flowers in May or June. Requires moist, acid soil. BP, GR, JA, SK, WA.

Kalmiopsis

Kalmiopsis leachiana (6-5B)
Shrub to 1 ft. with small evergreen leaves. Rosy-purple flowers in late May or early June. Full sun. Moist, peaty soil. SK, WA. *Named Form:* **'Le Piniec'.** BP, GR.

Lavender

Lavandula officinalis 'Compacta Nana' (5)
Dense evergreen shrublet to 8-10 in. Narrow

aromatic leaves. Silvery. Flowering in early summer. AL, MN, WA.

Labrador-tea

Ledum groenlandicum (2)
Evergreen shrub to 3 ft. Leaves woolly beneath. White flowers in late April. Suitable for a very moist or boggy site in acid, peaty soil. JA, WA.

Sand-myrtle

Leiophyllum buxifolium (5)
Evergreen shrub to 1½ ft. Tiny leaves. Small white flowers in early May. OL, RG, WE, 8.
Selected Forms: **'Nanum'.** To 10 in. More-or-less prostrate. AL, MN, WA.
'Prostratum'. Completely prostrate. ML, WA, 8.

Leucothoe

Leucothoe axillaris (6)
Coast Leucothoe
Evergreen shrub to 2 ft. with arching stems and dark green leaves. Small white bell-shaped flowers in racemes. Late May. Provide acid soil for all leucothoes. Shade tolerant. CR, HH, OL, RO, SP, WA, 5, 8, 9, 11, 20, 22, 25, 27, 32, 36, 40.

Leucothoe fontanesiana (catesbei) (5-4B)
Drooping Leucothoe
Evergreen shrub to 3-4 ft. Six- in.-long shiny leaves. Numerous but inconspicuous white heather-like flowers in late May. Foliage turns bronze in cold weather. CB, EA, EI, FO, GA, GI, LA, LT, SQ, TL, VI, WA, WE, 7, 9, 11, 16, 19, 27, 32.
Selected Forms: **'Girard's Rainbow'.** Leaves colored green, pink and cream. Not as arching in habit as the species. CB, CR, GI, JA, KI, LI, PA, RO, WE, 5, 8, 11, 19, 22, 25, 32, 36.
'Nana'. Small; spreading habit. WA, 11.

Leucothoe keiskei (5)
Graceful shrub to 3-4 ft. Three-in.-long leathery evergreen leaves. White flowers in mid-May. MN, WA.

Privet

Ligustrum obtusifolium 'Regelianum' (5)
Regel Privet
Mounded shrub to 4-5 ft. with notably horizontal branching. It is not always easy to obtain the true form in the trade. Handsome. DA, DU, EI, FO, GU, HG, LC, LI, LT, MA, SA, SH, WC, WE, 1, 10, 11, 17, 19, 27.

Ligustrum 'Suwanee River' (7)
Compact evergreen shrub to about 4 ft. Thought to be a hybrid of *L. japonicum* 'Rotundifolium' and *L. lucidum*. 22.

Ligustrum vicaryi (ovalifolium 'Aureum' x vulgare) (5)
Vicary Golden Privet
Slow-growing shrub to 4-5 ft. with golden-yellow foliage through the summer. Full sun. BA, GI, IN, KE, KR, MU, NE, SH, SN, WC, 1, 2, 10, 11, 13, 15, 19, 22, 27, 30.*

Ligustrum vulgare 'Lodense' ('Nanum') (4)
Dense mound to 4 ft. Suitable as a low deciduous hedge. No trimming necessary. Attractive. FO, PV, WE, 6, 23, 30.

For other **Privet** *see p. 59.*

Alpine-azalea

Loiseleuria procumbens (2)
Evergreen shrublet to 6-8 in. with small leaves. Small pink flowers in early summer. Moist, acid soil. AL, SK, WA.

Honeysuckle

Lonicera nitida (7-6B)
Box Honeysuckle
Handsome evergreen shrub to about 4 ft. Small glossy leaves. Sometimes used as a low hedge in the South. HO, WI, 29.

Lonicera pileata (6-5B)
Privet Honeysuckle
Horizontally branched shrub of small to medium size, evergreen in the South. Dense. Small shiny green leaves, refined for a honeysuckle. Amethyst-violet berries. ML.

Lonicera xylosteum 'Clavey's Dwarf' (4)
Shrub to 3-4 ft., used occasionally for a quick low hedge in cold climates. Inconspicuous white flowers. BA, CO, EI, FE, FO, GU, HG, IN, KE, KR, LC, MA, PN, PV, RH, SH, 1, 6, 15, 30.

Mahoberberis

Mahoberberis aquicandidula (Mahonia aquifolium x Berberis candidula) (5)
Fine-textured evergreen shrub to about 4 ft. with small spiny, holly-like leaves. Sparsely branched. Benefits from a sharp pruning in early spring. Shade required. Other similar crosses have occurred, but this hybrid seems the most ornamental because of its small foliage. ML, PA, WE, 19, 26.

Mahonia

Mahonia aquifolium (5)
Oregon-grape
Rather open-growing evergreen shrub to 3-4 ft. Shiny leaves resemble those of English holly. Small bright yellow flower spikes in late April and bluish-black berries in fall. Purple autumn foliage. Needs winter shade in the North. Very variable. CB, CO, GU, KE, KR, NE, PT, RO, SG, SI, VI, WB,

WC, 11, 17, 22, 26, 27, 33, 39.*
Selected Form: **'Compacta'.** Dense. LI, PT, 18, 22, 33.

Mahonia nervosa (5)
Mounded evergreen shrub to 2 ft. Shiny leaves. Large clusters of blue-black berries in autumn. BP, SI, WC, 33, 37.

For other **Mahonia** *see p. 60.*

Paxistima

Paxistima canbyi (4)
Evergreen shrublet to 1 ft. with small narrow leaves. Foliage bronze in cold weather. Flowers inconspicuous. Tolerant of some shade. This euonymus relative makes a fine ground cover or very low border or edging for shrub groupings in areas where scale insects are not troublesome. AL, CB, CO, GU, JA, KE, KR, LE, OL, PV, SH, SK, VA, VI, WA, WC, WE, WF. 8. 15.

Tree Peony

Paeonia suffruticosa (5-4B, with protection)
Open-growing shrub to 4-5 ft. Flowers large, white to pink and red; single or double. Many named forms. CB, DA, FA, GU, KE, SH, SQ, VI; also from Louis Smirnow, 85 Linden Lane, Glen Head P.O., Brookville, N.Y. 11545.

Pernettya

Pernettya mucronata 'Red' (7-6B)
Dense evergreen to 2-3 ft. Bright red berries retained all winter. For best fruiting, plant other forms as well. 21. **'White'**—white-fruited form. 21.

Pieris

Pieris floribunda (4)
Mountain Pieris
Handsome evergreen shrub usually growing to only 4-5 ft. in northern gardens. More-or-less upright clusters of white flowers in April. It is subject to lacewing infestation unless grown in shade or partial shade. CR, EI, GR, LC, OL, PW, RO, SL, VI, WA, WE, 7, 8, 11, 19.

Pieris 'Forest Flame' (forrestii x japonica) (7-6B)
Evergreen. New growth bright red. CB, GR, HH, KI, PA, SL, TL, WA, 5, 16, 21, 33.

Pieris japonica 'Compacta' (5)
Evergreen shrub to about 4 ft. Leaves smaller than in *P. japonica* (see p. 44.) CB, RO, SP, WA, WE, 5, 19, 32, 36.

Pieris japonica 'Dorothy Wyckoff' (5B?)
Superb deep purple-green winter foliage if grown in full sun. Flower buds pink. Choice. GR, HH, OL, PA, WA, 5, 20, 36.

Pieris japonica 'Pygmaea' (5B?)
Evergreen shrub to 2 ft. Leaves needle-like. AL, BP, GR, HH, KI, MN, PA, SK, WA, 32, 36.

Pieris japonica 'Variegata' (5B?)
Evergreen leaves have narrow white edges. Very slow-growing to about 2 ft. AL, CB, GR, HH, KI, OL, PA, SI, SL, WA, 25, 33, 36.
Other forms of pieris: HH, PA, WA, 5, 21, 36.

For other **Pieris** *see p. 44.*

Potentilla, Bush-cinquefoil

Potentilla fruticosa (2)
Bush-cinquefoil
Usually a mounded shrub to 3-3½ ft. Small leaves. Yellow flowers in late spring with occasional bloom through summer. Many forms, most with only slight differences.
Selected Forms: **'Beesiana'.** To 18 in. Silvery-green leaves. Flowers golden, large. AL, MN.
'Farreri' ('Golden Drop'). Deep yellow flowers. Small leaves. AE, BA, BU, DA, EI, FA, HH, KS, LC, LE, MA, PN, PV, SH, SQ, WC, 1, 6, 15, 30.
'Jackman's Variety'. Bright yellow flowers, rather large. BA, CO, EM, HG, HH, IN, KR, KS, LC, MA, PN, PV, RH, SH, SN, WC, WE, 6, 15, 30.
'Katherine Dykes'. Primrose-yellow. BA, FO, HH, JA, LC, LE, MA, PV, SA, SP, WC, WE, WF, 2, 6, 33.
'Maanely's' ('Moonlight'). Pale yellow. TL, WE, 41.
'Mount Everest'. White flowers. Vigorous. BA, GI, PV, WC, WF, 22.
'Tangerine'. Flowers orange, if grown in part shade. HH, ML, WC, WE.

Flowering Almond

Prunus glandulosa 'Albiplena' (5)
Dwarf White Flowering Almond
Shrub to 3-4 ft. Attractive double white flowers in late April. FO, IN, LE, WE, 11, 33.

Prunus glandulosa 'Sinensis' ('Rosea' of the trade) (5)
Dwarf Pink Flowering Almond
Shrub to 3-4 ft. Profuse double light-pink flowers, especially attractive in bud. Late April. BA, BU, CO, EM, FE, FO, GU, IN, KE, KR, PV, SA, SH, WB, ZI, 6, 11, 23, 27.*

Prunus tenella 'Fire Hill' (3)
Dwarf Russian Almond
To 3-4 ft. Profuse red flowers in early May. WC.

Arthur N. Orans

The potentilla's delicate rose-like flowers are a good foil for its dark green delicate foliage.

Azalea

Rhododendron 'Gumpo' ('White Gumpo') (6)
Dwarf compact evergreen shrub with exceptionally large white flowers in late spring or early summer. CB, HA, HO, NU, OL, RO, SW, TL, WA, 8, 27, 33, 40.

Rhododendron indicum 'Balsaminaeflorum' (6B)
Dwarf evergreen shrub to 1½-2 ft. Double salmon-pink flowers in June. Needs shade from direct sun to preserve color. GR, KI, ML, OL, RG, SW, 8.

Rhododendron indicum 'Flame Creeper' (6B)
Low-growing, semi-prostrate evergreen shrub with orange-red flowers in late May. CB, HO, OL, RA, RG, SW, TL.

Rhododendron kiusianum (obtusum japonicum) (6B)
Dense, semi-prostrate evergreen shrub to about 1 ft., spreading to 3 ft. Lavender-pink flowers in late April or early May. AL, BP, GR, HH, HO, OL, RA, SL, WE, 25, 34.

Rhododendron 'Pink Gumpo' (6)
Similar to 'Gumpo', but with pink flowers. CB, HA, NU, OL, RO, SW, TL, WA, 8, 27, 33.

For other **Azaleas** *see page 44.*

Rhododendron

Rhododendron 'Anna Baldsiefen' (5B?)
Compact shrub to 1½ ft. or more. Small evergreen leaves with many vivid light-rose flowers in late April or early May. BL, HH, HO, OL, PW, WA, 25, 34.

Rhododendron 'Bow Bells' (williamsianum hybrid) (5)
Dense shrub to 3 ft. with light evergreen leaves. Large bell-shaped pink flowers in late April or early May. BP, GR, HF, HH, RA, SL, 8, 33, 34.

Rhododendron 'Elizabeth' (repens x griersonianum) (6)
Dense semi-prostrate shrub to about 3 ft. Large evergreen leaves. Large dark red flowers in April. AL, GR, HF, IS, WA, 33, 34.

Rhododendron ferrugineum (4B)
ALPEN-ROSE
Rounded shrub, eventually to 3-4 ft., that is prized mostly for its rather small evergreen leaves, rusty beneath. Rosy-lilac flowers of modest size in June or July. Thrives in cool climate. BP, GR, RA.

Rhododendron impeditum (4B)
Compact mound to 15-18 in. Scaly evergreen leaves ½-in. long, ¼-in. wide. Flowers purplish-blue to lavender-pink. April. AL, BP, CB, GR, HF, HH, IS, OL, RA, RO, SL, WA, 16, 19, 22, 33, 34.

Rhododendron keiskei (dwarf form) (5)
Compact low evergreen shrub, small leaves. Lemon yellow flowers in mid-April. BP, CB, GR, HH, OL, RA, SL, WA, 8, 34.

Rhododendron P.J.M. Hybrids (carolinianum x dauricum) (5)
Tight mound to 4 ft. or more with small evergreen leaves which become purplish-bronze in winter. Lavender-pink flowers in early or mid-April. Slight variations in flower color and habit may be expected. BL, BP, CB, GR, HF, IS, KE, PV, PW, RA, RH, SH, SP, 2, 5, 8, 11, 19, 25, 32.*

Rhododendron racemosum (5)
Dense shrub to 18 in. or more. Small evergreen leaves. Pinkish-white flowers in early May. OL, RA, RO, SL, WA, 8.

Rhododendron radicans (5B)
Prostrate evergreen shrublet to 6 in. high. Leaves bright green. Comparatively large purple flowers in May. AL, BP, RA.

Rhododendron 'Ramapo' (4)
Compact evergreen mound to 2 ft. or more. Small, light blue-green foliage. Pale violet flowers in late April or early May. BL, BP, GR, HF, HH, IS, OL, PA, PW, RA, SL, SP, WA, WE, 2, 33.

Rhododendron rupicola (6?)
Evergreen cushion to about 15 in. high. Dark violet-purple flowers in May. Native to lime-stone cliffs in Yunnan. GR, LG.

Rhododendron williamsianum (5)
Evergreen shrub to 2 ft. or more. Spreading. Fairly small coin-like leaves, tinged bronze. Large shell-pink flowers in April. AL, BP, GR, HH, RA, WA.

Rhododendron yakusimanum (4?)
Dome-shaped shrub to about 2½ ft. Evergreen leaves with conspicuous indumentum. Pink flower clusters, turning white. May. BP, CB, GO, GR, IS, OL, PA, PW, RA, SL, SP, WA, 34.

For other **Rhododendrons** *see p. 46.*

Jetbead

Rhodotypos scandens (kerrioides) (5)
Shrub to about 4 ft.; 2-in.-wide white rose-like flowers in early May, briefly retained. Shiny black fruit usually lasts well into winter, and birds will eat it when other fruits are scarce. Not a first-rate shrub, but useful in a wild-life planting. FO, LC, LI, 1, 19, 27, 41.

Sumac

Rhus aromatica (canadensis) (3)
Fragrant Sumac
Vigorous prostrate shrub to 3 ft., several times broader than tall at maturity. Yellowish flowers in late April. Orange-yellow autumn color. Bank cover. BA, DU, EI, FO, KR, LI, PV, RH, SH, 1, 11, 14, 15, 19, 23, 27, 38.
Named Form: **'Gro-low'**—SH, 6.

For other **Sumacs** *see p. 62.*

Rose-acacia

Robinia hispida (5-4B)
Loose shrub to 3 ft. or more, with attractive purplish-rose pea-like flowers in late May. Stems with red bristles. Useful for bank planting because of its suckering habit. GA, GS, LI, 11, 19, 23, 38.

Rose

Rosa nitida (3)
Shrub to 2-3 ft. with single rosy-red flowers in late May or June. Small red fruit. Lustrous foliage. 27.

Rosa rugosa hybrid 'Max Graf' (3?)
Trailing rose with single pink flowers. Ground cover. WC, WE, 27.

Rosa wichuraiana (5)
Memorial Rose
Trailing shrub suitable as a bank cover. Two-in.-wide white flowers in early summer. Shiny foliage retained late in autumn. Fruits red. SH, VI, WC, WE, 1, 10, 17, 19, 27.

For other **Roses** *see pages 47, 62.*

Willow

Salix purpurea 'Gracilis' ('Nana') (3)
Dwarf Artic Willow
Compact shrub to 4 ft. Grayish foliage. Useful for low hedges. CO, FE, GU, HO, KE, MA, MB, SH, SN, WC, 30.

Salix repens (4)
Creeping Willow
Prostrate shrub to 3 ft. high. Ascending branches; small leaves. SH.

Salix uva-ursi (2-1)
Bearberry Willow
Creeping, forming dense mats. To 2-3 in. high. Catkins in early spring. MN.

Sarcococca

Sarcococca hookeriana humilis (6-5B)
Shrub to 6 in. Handsome evergreen leaves. Fragrant small white flowers. Ground cover. AL, CB, DA, TL, 8, 16, 22, 33.

Sarcococca ruscifolia (7)
Evergreen shrub to 4-5 ft. Roundish deep green leaves. Inconspicuous but fragrant flowers in autumn or early winter. Dark scarlet berries. Shade. 16, 29, 33.

Siphonosmanthus

Siphonosmanthus (Osmanthus) delavayi (7)
Evergreen shrub with small glossy dark green leaves. Handsome. Blue-black berries. AL, SI.

Skimmia

Skimmia japonica (6B)
Japanese Skimmia
Handsome compact evergreen shrub to 4 ft. Bright red berries retained over a long period in autumn. Dioecious. Modestly ornamental, fragrant yellowish-white flowers in late April or early May. This and the following species require winter shade. CB, DA, RO, SI, TL, 19, 33, 39.

Skimmia reevesiana (6B)
Reeves Skimmia
Evergreen shrub to 1½ ft. Small white flowers. Dull red berries, borne on each plant, retained late into winter. Ground cover. HH, PF.

Spirea

Spiraea albiflora (callosa alba) (4)
Japanese White Spirea
Tight mound to 18 in. Flat clusters of white flowers in early summer. FO.

Spiraea bullata (5)
Twiggy shrub to 15 in. Crinkly leaves. Bright pink flowers in early summer. AL, KI, MN, PA, WA.

Spiraea bumalda 'Anthony Waterer' (japonica x albiflora) (3)
Dense shrub to 3 ft. Flat clusters of crimson flowers in early summer. Prune spent flower stalks to promote bloom. BA, FA, FO, GU, LT, MA, PT, PV, SH, SI, SN, WB, 10, 11, 17, 19, 22, 27, 30, 39.*
Other Forms: **'Crispa'.** To 18 in. Small twisted leaves, refined for a spirea. KR, 2.
'Froebelii'. Froebel Spirea. Similar to 'Anthony Waterer', but slightly taller and with sufficient new growth in summer to hide the spent flowers. AE, BA, FA, FE, FO, HG, KS, LC, MA, PV, RH, SH, SQ, ST, VA, 6, 15, 30, 38.

Spiraea japonica alpina (5)
Japanese Alpine Spirea
Tight mound to 1 ft. Light pink flowers in mid-June. Refined. AL, CB, CO, CR, FA, FO, IN, MN, WC, WE, 6, 27, 32.

Spiraea japonica 'Atrosanguinea' ('Coccinea') (5)
Shrub to 4 ft., new foliage reddish. Flat clusters of deep crimson flowers in summer. CB, CR, EI, FE, MB, NE, 1, 19, 23, 30.

Stephanandra

Stephanandra incisa (flexuosa) 'Crispa' (5)
Dwarf Stephanandra
Shrub to 2 ft. with refined, deeply cut leaves. Suitable as a ground or bank cover. Best trimmed in early spring to retain good form. Its suckering habit can make it a nuisance in small gardens where it is often planted because of its neat foliage. ML, RG, SH, WA, 6.

Germander

Teucrium chamaedrys (6)
Dense evergreen shrublet to 8-10 in. Attractive small leaves. Rose-purple flowers in summer. Edging or miniature hedge plant. BU, CB, DA, KE, SN, VI, WC, WE, WF, 2.
Selected Form: **'Prostrata'.** 3-in.-high mat. PR, RG, WE, WI.

Blueberry, Cranberry

Vaccinium angustifolium (pennsylvanicum) (2)
Lowbush Blueberry
Loose ground cover to about 8 in. Scarlet autumn color. Acid soil. Edible fruit. DU, 19.

Vaccinium vitis-idaea minus (3)
Mountain Cranberry
Mat-forming shrublet to 4 in. high. Very small leaves. Pinkish-white flowers in mid-May. Red berries. Full sun. Ground cover. BP, CB, HH, JA, PA, SK, WA, WE, WI, 8, 33.

Viburnum

Viburnum davidii (7)
David Viburnum
Compact evergreen shrub, usually to only 3 ft. in the U.S. Grown mainly for its long, deeply creased leaves. Small white flower clusters in late May or June. Occasionally with light blue berries in autumn. Handsome ground cover in the Northwest. HF, SI, 16, 18, 22, 33.

Viburnum opulus 'Nanum' (4?)
Unusually dense, almost ball-shaped shrub to about 3 ft. Grown chiefly for its refined, closely set, small leaves. Non-flowering. Not to be confused with 'Compactum' (see page 64.) BA, CH, CO, DA, FO, LC, PA, PN, PV, RH, RO, SH, VA, WC, WE, 1, 11, 15, 23, 27.

For other **Viburnums** *see pages 52, 63.*

Yellow-root

Xanthorhiza simplicissima (apiifolia) (4)
Stoloniferous shrub to 2 ft. high. Finely cut leaves. Tiny but interesting brownish-purple flowers in late April. A vigorous spreader, useful as a ground cover. GA, GS, WE, 11, 27.

DWARF CONIFERS

Low-growing or Slow-growing Conifers

Fir

Abies balsamea hudsonia (3)
Flat-topped deep green form to about 2-1/2 ft. AL, KM, OL, RA, SL, WF, 32.

Abies balsamea 'Nana' (3)
Unusually slow-growing, ball-shaped fir to 1-1/2 or 2 ft. CB, GR, HH, KM, PA, RG, S1, SK, SL, WA, 8.

Abies concolor 'Compacta' (4)
Irregular, flat-topped; to about 2-1/2 ft. Gray needles. KM, SL, WA, 36.

Abies koreana 'Prostrata' (5)
Low, compact, spreading shrub with horizontal or upturned branches. KM, OL, PA, RG, WA, WE, WF, 14, 36.

Abies lasiocarpa 'Compacta' (6)
Broadly conical, densely branches; blue-gray foliage. Vigorous. PA, SH, WA, WE, WF, 42.

Abies procera (nobilis) 'Prostrata' (4)
Irregular, more-or-less flat-topped; to 3 ft. Glaucous foliage. RF, WA, 14.

Cedar

Cedrus libani 'Comte de Dijon' (6)
Dense, broadly conical; to 4-5 ft. Short needles. K1, SL, WA.

Cedrus libani 'Sargentii' (6)
Very dwarf and unusually slow-growing; pendulous branches. AL, CB, KI, PA, SL, WA, 8.

False-cypress

Note: The name "Retinospora" (more correctly "Retinispora"), which was used in the 19th century for certain false-cypress forms with awl-shaped ('juvenile') leaves, is obsolete botanically, but is still sometimes used. Some nurseries still list *Chamaecyparis* under "Retinospora."

Chamaecyparis lawsoniana 'Ellwoodii' (6-5B)
Slow-growing shrub to about 8 ft. Spire-like. KI, PT, WA, 2, 19, 21, 33.

Chamaecyparis lawsoniana 'Forsteckensis' (6)
Dense globe with congested growths. A slow-growing form with gray foliage. Eventually to about 1-1/2 ft. AL, HH, KI, SL.

Chamaecyparis lawsoniana 'Gimbornii' (6)
Oval form to about 2 ft. Rigid, slow-growing. AL, PA, 36.

Chamaecyparis lawsoniana 'Minima' (6)
Broad-based conical shape. Slow-growing to 2-2-1/2 ft. Light green. PA, RA, WA.

Chamaecyparis lawsoniana 'Minima Glauca' (6)
Distinctive for its metallic blue-gray foliage. To about 3 ft. AL, K1, RA, SL, TL, WE, 21.

Chamaecyparis lawsoniana 'Pygmaea Argentea' (6)
Slow-growing to about 2 ft. Variegated. PA, RF, SL.

Chamaecyparis obtusa 'Caespitosa' (5)
One of the smallest conifers, seldom more than 8-10 in. high. Ball-shaped. AL, KI, KM, RA, SL.

Chamaecyparis obtusa 'Coralliformis' (5)
Twisted cord-like branches with adpressed leaves. To 3 ft. or more. AL, HH, KI, ML, SL, WA, WF, 8, 21, 36.

Chamaecyparis obtusa 'Juniperoides' (5)
Very slow-growing, forming a tight green ball seldom more than 1 ft. KM, RA, SL, 21.

Chamaecyparis obtusa 'Lycopodioides' (5)
Shrub to 4-1/2 ft. or more. Branches irregularly crowded. Loose growth habit. HH, K1, OL, SL, WA, WE, WF.

Chamaecyparis obtusa 'Lycopodioides Aurea' (5)
Similar to the preceding, but with yellow foliage. Slower-growing. AL, K1, KM, SP, 36.

Chamaecyparis obtusa 'Mariesii' ('Nana Albovariegata') (5)
Unusually slow-growing conical shape to about 2 ft. Variegated. KI, SL, WA, 21, 25, 36.

Chamaecyparis obtusa 'Nana' (5)
Exceptionally slow-growing. Squat habit. To 2 ft. Dark green. Choice. AL, CB, G1, GR, HH, OL, PA, PT, RA, SK, SL, TL, WA, 2, 3, 14, 18, 21, 33, 36.

Chamaecyparis obtusa 'Nana Gracilis' (5)
Slow-growing; broad conical shape and deep green foliage. Takes many years to attain 7 ft. AL, DA, G1, GR, HH, JA, PA, RA, SI, SP, TL, WA, WE, WF, 19, 25, 27, 32, 36, 39.

Chamaecyparis obtusa 'Spiralis' (5)
Small, stiffly upright form with curiously twisted branchlets. Distinct. KM, MN, PA, SL, WA.

Chamaecyparis obtusa 'Tetragona Aurea' (5)
Slow-growing to 6 ft. or more. Compact, conical. Short crowded branches. Yellow foliage. DA, HH, K1, OL, PA, SL, WF, 8, 21, 25.

Chamaecyparis pisifera 'Filifera Nana' (4)
Dense, flat-topped; to about 3 ft. Branchlets fan-shaped. Dark bluish-green foliage. AL, MN, SH, SL, 25.

Chamaecyparis pisifera 'Nana' (4)
Squat, more-or-less globose. Glaucous foliage. To about 2 ft. in old age. AL, G1, RO, WF, 21, 32.

Chamaecyparis pisifera 'Plumosa Nana Aurea' (4)
Slow-growing rounded form. To 2-1/2 ft. Lacy branchlets. Young foliage golden yellow. AL, HO, MN, RF.

Chamaecyparis pisifera 'Squarrosa Minima' ('Squarrosa Pygmaea') (4)
Dense bun to 1 ft. or more. Silvery gray. If vigorous whip-like shoots appear they should be pruned out to maintain compact, even form. Perhaps synonymous with 'Intermedia', which left to its own devices may become a pyramidal tree growing to 10-12 ft. AL, CB, DA, S1, SK, SL, TL, WA, WE, WF, 36.

Cryptomeria

Cryptomeria japonica 'Elegans Nana' (6)
Vigorous shrub to about 3 ft. Feathery foliage, purplish in winter. Distinct, but ages poorly. AL, CB, MN, SL, 36.

Cryptomeria japonica 'Globosa Nana' (5)
Tight globe growing to perhaps 3 ft. Yellowish-green foliage in summer, slightly blue in winter. K1, MN, SL, 36.

Cryptomeria japonica 'Jindai-Sugi' (6)
Compact, upright habit, to 5 ft. or more. Slightly flattened top. AL, MN, 21, 36.

Cryptomeria japonica 'Knaptonensis' (6)
Tight cushion, growing slowly to about 2 ft. AL, MN, PA, SL, 21.

Cryptomeria japonica 'Monstrosa Nana' (6)
Irregular, broadly pyramidal, to about 3 ft. Growth more-or-less congested. Best seen before giving it a trial. AL, K1, PA, SL, WA.

Cryptomeria japonica 'Pygmaea' (6)
Slow-growing, irregularly flat-topped; to about 3 ft. Reddish-bronze in winter. AL, MN, PA, SL.

Cryptomeria japonica 'Spiralis' (6)
Slow-growing, rather open habit to about 3 ft. Needles twisted spirally along the stem. AL, MN, PA, SL, 21.

Cryptomeria japonica 'Vilmoriniana' (6)
Dense rigid globe attaining 2-2-1/2 ft. after many years. Foliage turns brown in winter, but not objectionably so. Handsome. AL, CB, MN, OL, PA, SL, WA, 8, 21, 36, 39.

Juniper

Juniperus chinensis 'Armstrongii' (4)
Dense shrub to 3 ft. high and as much across. Branches wide-spreading. Soft gray-green foliage. LC, L1, PT, TA, 1, 4, 10, 18, 22, 26, 29, 40.

Juniperus chinensis 'Blaauw' (4)
Dense shrub to about 4 ft. with spreading branches. Somewhat vase-shaped. Leaves mostly scale-like, blue-green. AL, CO, CR, DA, G1, KS, LA, PV, RH, SH, VA, WE, 11, 14, 15, 19, 21, 22, 25, 36.

Juniperus chinensis 'Hetzii' (5-4B)
HETZ JUNIPER
Broad upright shrub to 10 ft. or more. Vigorous, fountain-like effect with age. Gray-green foliage. Hardly a dwarf, but included here for convenience. CO, G1, LA, LT, MA, MU, PV, RO, SN, WE, 1, 2, 10, 15, 19, 22, 30, 32, 33, 39.*

Juniperus chinensis 'Old Gold' (4)
Wide-spreading compact shrub to 3-4 ft. Golden foliage. CO, K1, KS, OL, SH, SI, 2, 8, 21, 25, 29, 33, 36.

Juniperus chinensis 'Pfitzeriana' (4)
PFITZER JUNIPER
Vigorous broad shrub to 5 ft. or more. Gracefully irregular, arching branches. Foliage bright green to blue-green. Popular with reason. Most nurseries.

Juniperus chinensis 'San Jose' (4)
Spreading, loosely prostrate shrub to about 2 ft. high at maturity, but much broader. Gray-green. CH, FO, K1, L1, PV, SP, TA, 1, 4, 11, 15, 18, 21, 22, 29, 33, 36, 40.

Juniperus chinensis sargentii (4-3B)
SARGENT JUNIPER, SHIMPAKU
Prostrate shrub to about 2 ft. high, spreading to as much as 10 ft. wide. Light green or bluish-green. Bonsai candidate, as are many other shrubby kinds of Chinese juniper. CH, DA, FO, GI, LA, LC, L1, MA, S1, VA, WE, 12, 14, 17, 19, 21, 29, 30, 36, 40.

Juniperus chinensis 'Sargentii Glauca' (4)
Similar to the preceding, but with glaucous foliage. CB, CH, CR, EI, GI, L1, OL, PV, SH, S1, WE, 1, 11, 14, 15, 22, 26, 29, 36.

Juniperus communis 'Compressa' (5)
Very slow-growing sharply columnar form. Rarely attains 3 ft. Resembles a miniature Italian cypress. AL, OL, PA, SK, WA, WE, 8, 21.

Juniperus communis 'Depressa Aurea' (4)
Prostrate shrub to 2-2-1/2 ft. high, broadly spreading. Leaves shaded golden yellow to bronze. OL.

Juniperus communis 'Echiniformis' (4?)
A tiny prickly hummock. Slow-growing to about 1 ft. Distinctive. KI, SL, WA.

Juniperus communis 'Hornibrookii' (4)
Ground-hugging mat to 2 ft. high. Small leaves densely crowded on the branches. HH, KI, OL, WE, 8, 25.

Juniperus communis 'Repanda' (4)
Dense prostrate shrub to about 1 ft. KI, SH, SL, 32.

Juniperus conferta (5)
Shore Juniper
Creeping prostrate shrub, ultimately to 1-1/2 ft. high. Young growth light green, later grayish. EA, HA, OL, PA, SP, WA, WF, 1, 4, 8, 11, 17, 18, 22, 25, 26, 27, 29, 32, 40.

Juniperus davurica 'Expansa' (squamata 'Parsonsii') (4)
Parsons Juniper
Spreading flat-topped shrub. Gray-green. Ultimately a broad dome to 3 ft. tall. Branches horizontal, held above ground. CR, GI, LA, RO, TA, TL, 8, 20, 22, 25, 36.

Juniperus horizontalis (3)
Creeping Juniper
Prostrate mat with long creeping branches. To 1 ft. high. Gray or bluish-green foliage. This and its forms are handsome ground or bank covers on sunny sites. WE, 29, 32.

Juniperus horizontalis 'Bar Harbor' (3)
Dense mat. Steel blue foliage. FO, GI, LA, LI, MU, OL, PV, RO, WE, 1, 2, 11, 12, 15, 22, 26, 27, 32, 33, 40.*

Juniperus horizontalis 'Glomerata' (4)
Prostrate. Branches end in tight clusters. KI, PA, SL, WA.

Juniperus horizontalis 'Douglasii' (3)
Waukegan Juniper
Prostrate branches and ascending branchlets. Blue-green in summer, purple in winter. CH, FO, KI, PV, SI, SP, WE, WF, 11, 19, 21, 26, 27.

Juniperus horizontalis 'Plumosa' (4)
Andorra Juniper
Spreading, prostrate. To 2 ft. Light green. It is available from most nurseries.

Juniperus horizontalis 'Plumosa Compacta' (4)
Prostrate compact form of Andorra juniper. CB, CO, FE, KS, LT, MA, NE, RH, TL, WE, 1, 11, 12, 22, 25, 30, 32, 38, 40.*

Juniperus horizontalis 'Wiltonii' (3)
Blue Rug Juniper
Silvery blue carpet. One of the best. FO, GI, LA, MU, PA, PV, RO, SI, TL, 1, 2, 11, 15, 19, 21, 22, 27, 32, 39, 40.*

Juniperus procumbens (5-4B)
Japanese Juniper
Rigid, spreading, thick mat with ascending branchlets. 1-2 ft. Bluish-green. Bonsai candidate. FE, FO, KI, LI, MA, NE, PV, SI, 1, 15, 21, 30, 32, 33, 40.

Juniperus procumbens 'Nana' (4)
Dwarf form of the preceding. Choice. Bonsai candidate. Plants vary, some being more tightly knit than others. Material sold in the trade as *J. squamata* 'Prostrata' is usually *J. procumbens* 'Nana'. The true *J. squamata* 'Prostrata', a different plant with branchlets nodding at the tips, is seldom encountered in American gardens. CB, LC, LI, OL, PA, PT, RO, SK, SL, WE, WF, 1, 11, 14, 15, 22, 26, 29, 32, 40.*

Arthur N. Orans

Junipers and mugho pines can supplement a house's architecture. Using dark green, light green or golden foliage plants further emphasizes the sense of design.

Juniperus sabina 'Arcadia' (4)
Dense spreading form to about 1-1/2 ft. high. Light green. CO, K1, KS, LC, PN, PT, PV, SH, WE, 4, 15, 22, 29.

Juniperus sabina tamariscifolia (4)
Bright green prostrate shrub to about 2 ft. high. Branchlets partly upright. FO, G1, KS, MU, PT, RO, SH, S1, SL, SP, VA, WF, 4, 11, 15, 21, 22, 29, 30, 33.*

Juniperus squamata 'Meyeri' (4)
Loose shrub to 4 ft. or more. Irregularly upright. Beautiful steel blue foliage. Best while young. K1, LC, L1, PA, PV, SH, TA, WA, 15, 19, 21, 25.

Juniperus virginiana 'Gray Owl' (4)
Wide-spreading shrub to 4 ft. tall. Habit similar to Pfitzer juniper. Silvery gray. CB, CH, CO, K1, TL, WE, 15, 26.

Spruce

Picea abies (excelsa) 'Clanbrassiliana' (3)
Dense flat-topped bush with crowded branches. To about 6 ft. in old age. Bright green. Prominent reddish-brown buds. AL, K1, PA, RA, SL, WE, 8, 19, 25, 36.

Picea abies 'Echiniformis' (3)
Dense cushion to 2-3 ft. Crowded branchlets and small sharp needles. Light green. KI, OL, SH, SK, SL, TA, WA, WF, 36.

Picea abies 'Gregoryana' (3)
Dense globe or cushion to about 2 ft. Irregular with age. Grayish-green. K1, PA, RO, SL, WE, 21, 25, 36.

Picea abies 'Maxwellii' (3)
Dense, more-or-less flat cushion to 3-4 ft. Bright green. If strong shoots with large needles appear, they should be cut out. CB, DA, GR, K1, RO, SL, SP, WA, WF, 25, 32, 33, 36.

Picea abies 'Nidiformis' (3)
To about 3-1/2 ft. While young, the branches are arranged to form a flattened depression, somewhat resembling a bird's nest. CB, G1, GR, LC, LT, PA, PV, RO, SH, S1, SP, VA, WF, 2, 11, 15, 16, 19, 21, 27, 39.*

Picea abies 'Procumbens' (3)
Dense bush to 3-4 ft. and two-to-three times as broad as tall. Horizontal branching with exceptionally long needles for a dwarf form. Light green. RA, RF, RG, 36.

Picea abies 'Pumila' (3)
Low, spreading; to 3 ft., and broader than tall. Soft needles. AL, HH, PA, SL, WA, 8, 21, 36.

Picea abies 'Remontii' (3)
Dense conical shape; to about 6 ft. Bright green. Brown buds conspicuous in winter. GR, K1, LT, PA, RA, S1, SL, WE, 25.

Picea abies 'Repens' (3)
Prostrate or spreading form to about 1-1/2 ft. tall. Dense branches rest flat on each other. Light green. GR, HH, KI, S1, SL, WE, 8, 21, 32, 36.

Picea abies 'Tabuliformis' (3)
Low mat with horizontal branching. Flat-topped. To 2-1/2-3 ft. tall. Light green. K1, PA, SL, 36.

Picea glauca 'Conica' (3)
Dwarf Alberta Spruce
Dense symmetrical cone; after many years to about 10 ft., with a spread of 4-5 ft. Very formal. CB, GI, GR, HH, NE, PA, PT, RH, SH, SL, SP, WF, 15, 16, 17, 19, 27, 32, 33, 39.*

Picea pungens 'Glauca Prostrata' (3)
Handsome wide-spreading, prostrate form of Colorado blue spruce. Should a leader form, it may be cut out to preserve the prostrate habit. RF, SL.

Picea pungens 'Globosa' ('Glauca Globosa') (3)
Somewhat flat-topped globe form of Colorado blue spruce. To about 4 ft. AE, CB, CO, GR, KI, OL, PA, SH, SL, WA, WE, WF, 14, 25, 32, 36.

Picea pungens 'Montgomery' (3)
Dense spruce to 5-6 ft. high. Broad. Blue. GR, HH, KI, PA, PN, SL, SP, WA, WE, 8, 14, 36.

Pine

Pinus aristata (5)
Bristlecone Pine
A dense, very slow-growing low shrub when grown in the East. Sometimes a small tree in western gardens. CB, G1, GR, LC, MU, OL, PA, RO, SG, SH, S1, WE, YB, 8, 14, 15, 19, 21, 24, 33.*

Pinus densiflora 'Pendula' (4-3B)
Pendulous, more-or-less prostrate form. Stake while young for best effect. AL, CB, K1, OL, SL, WE, 8, 14, 25, 42.

Pinus densiflora 'Umbraculifera' (4-3B)
Tanyosho Pine (See page 35.)

Pinus mugo var. mugo (mughus) (3)
Mugho Pine
Slow-growing shrub to 8 ft. or more, as broad as tall. Pinch new shoots or "candles" while young to make a dense compact plant. Variable. BU, FO, LA, LT, PN, PT, SH, S1, SP, TL, VA, 2, 11, 15, 26, 27, 30, 32, 33, 39.*

Pinus mugo pumilio (3)
A more-or-less prostrate variety of mugho pine. Lower growing and more dense than the preceding. Deep green. AL, CO, G1, K1, LC, L1, PN, SI, 8, 14, 25, 33, 35, 36, 37.

Pinus pumila (4)
Dwarf Siberian Pine
Compact five-needle pine similar to a *Pinus strobus* dwarf and sometimes confused with it. Usually broader than tall. Blue-green cast. AL, CB, KM, RF, WA, 42.

Pinus strobus 'Nana' (3)
Dwarf White Pine
Broad dense bush to 4-6 ft. Bluish-green. CB, DA, GI, HH, KI, LC, PA, SL, SP, WA, WE, WF, 8, 19, 25, 32, 33, 36.

Pinus strobus 'Umbraculifera' (3)
Broad dome-shaped shrub with short trunk. Leaf clusters drooping. Ultimately to 10-12 ft. KM, RF, SL, 8, 42.

Pinus sylvestris 'Beuvronensis' (3)
A Scots pine form that is a densely branched little mound. Perhaps to 2 ft. and a little broader. Leaves slightly twisted. AL, KI, PA, SL, WA, 21, 36.

Oriental Arbor-vitae

Platycladus orientalis 'Aurea Nana' (6)
Oval shape; height about 5 ft. Golden yellow in spring. Often called "Berckmans arborvitae" in the trade. Usually listed under *Thuja orientalis* in catalogs. DA, PT, WB, 1, 3, 10, 11, 12, 17, 18, 22, 26, 29, 33, 38.

Yew

Taxus baccata 'Adpressa Fowle' (5)
Dense shrub, very slow-growing to about 5 ft. and broader than tall. Very short needles. Distinctive. OL, SL, WA, WE, 36.

Taxus baccata 'Adpressa Stricta' (6)
Columnar form to 10-12 ft. Short horizontal branches. CB, DA, SL, WA.

Taxus baccata 'Repandens' (5)
Weeping English Yew
Shrub to about 3 ft. high and 6 ft. wide. Branches sweep the ground. Relatively long needles. Deep green. Attractive loose ground cover on a shady bank. CH, DA, TL, WA, WE, 2, 3, 9, 11, 21, 27, 33, 36, 39.

Taxus cuspidata 'Densa' (4)
Dense cushion, growing slowly to 4 ft. high and twice as broad. One of the best forms of Japanese yew. CH, LA, LI, RH, RO, SN, WE, WF, 2, 3, 14, 15, 17, 21, 27, 36, 39.

Taxus cuspidata nana (4)
Dwarf Japanese Yew
A low, dense, wide-spreading shrub for many years, but ultimately reaching 8 ft. or more, and twice as broad. Short bright green needles. AL, CH, DA, FA, LI, PV, PW, RH, RO, SH, SI, WE, 2, 15, 21, 27, 33, 39.
Note: Many other forms of Japanese yew and hybrid yew (*T. media*) exist in the trade. Virtually every general nursery in colder parts of the country stocks at least several forms. Should it not be possible to obtain these plants locally, most of the firms cited in this Handbook will be able to supply them.

Arbor-vitae

Thuja occidentalis 'Ellwangeriana Aurea' (3)
A tight pyramid to about 6 ft. Golden foliage. AL, SL, 8, 32.

Thuja occidentalis 'Ericoides' (4)
Rather open, broad pyramid to 4-5 ft. Dull green. Foliage brown in winter. RF, SL, SP.

Thuja occidentalis 'Globosa' (3)
Compact globe form to 5-6 ft., somewhat broader. Bright green. DA, FE, GU, HG, MA, SN, SQ, VA, WB, 19, 33, 36, 38.

Thuja occidentalis 'Hetz Midget' (3)
Very slow-growing, globe-shaped shrub; 2-2-1/2 ft. after many years. GI, GR, OL, PA, WE, 2, 21, 36.

Thuja occidentalis 'Woodwardii' (3)
Dense globe form, spreading with age. Old shrubs may attain 6 ft. or more. Green winter and summer. CO, CR, FO, GI, LT, MU, PN, PV, RO, SH, SI, WE, 1, 2, 10, 15, 21, 26, 27, 33.

Thuja orientalis 'Aurea Nana'. See **Platycladus.**

Thuja plicata 'Cuprea' (5)
Low, conical shrub, perhaps to 3 ft. after many years. Young foliage is bright gold. KM, RF, SL, WA.

Thuja plicata 'Rogersii' (5)
Densely compact pyramid to about 4 ft. More-or-less oval or globe-shaped while young. Golden yellow. AL, MN, RA, RG, SL, WA.

Hiba Arbor-vitae

Thujopsis dolabrata 'Nana' (6)
Densely bushy, somewhat spreading to 3-4 ft. Foliage resembles *Thuja*, but is more flattened. Shiny bright green. AL, ML, MN, PA, SL, WA, 21.

Hemlock

Tsuga canadensis 'Bennett' (4)
Spreading form with weeping branch tips. To about 3-1/2 ft., and broader than tall. Like a Sargent weeping hemlock in miniature, and better suited for the small garden. HH, KI, PA, SL, WA, 8, 14, 21, 36.

Tsuga canadensis 'Cole' (4)
Cole's Prostrate Hemlock
The most prostrate form, just a few inches high, although with age it becomes some-

M. Joyner

One of the world's oldest Sargent weeping hemlocks *(Tsuga canadensis pendula)* at Planting Fields Arboretum, Oyster Bay, New York. It is about 10 feet high and nearly 100 years old.

what mounded. Sometimes staked and allowed to droop, resembling a diminutive Sargent weeping hemlock. Usually performs best in part shade. AL, CB, HH, KI, OL, PA, SK, SL, WA, 8, 14.

Tsuga canadensis 'Horsford's Dwarf' (4)
Symmetrical globe to 1 ft. or slightly more. Short, closely set needles. RF, SL, WA.

Tsuga canadensis 'Hussii' (4)
Upright shrub to about 3-1/2 ft. Short, interestingly asymmetrical branches. KI, OL, PA, SL, WA, WE, 21, 36.

Tsuga canadensis 'Jervis' (4)
Compact, somewhat irregular pyramid with ascending branches. To about 2-1/2 ft. AL, KI, OL, PA, SL, WA, 14, 36.

Tsuga canadensis 'Minima' (4)
Dense globe with short needles. 2-3 ft. CB, KI, OL, PA, SL, WA, 36.

Tsuga canadensis 'Minuta' (4)
An irregular globe, as wide as it is high. Very slow-growing to about 1 ft. KI, MN, PA, SL, WA.

Tsuga canadensis pendula
SARGENT WEEPING HEMLOCK (See p. 38.)

Importing Nursery Stock From Overseas

GARDENERS in the U.S. and Canada may order plants from overseas nurseries, although obviously there is some risk involved. The plants must enter in bare-root condition, although certain packing materials such as sphagnum moss are permitted. Also the plants may be in transit for a long period, depending on method of transportation, point of origin and plants' final destination. There are authorized inspection stations at Kennedy International Airport, New York, and at Hoboken, N.J. Other stations are at Miami, Fla.; New Orleans, La.; Brownsville, El Paso and Laredo, Texas; Nogales, Arizona; San Francisco and San Pedro, California; Seattle, Wash.; San Juan, Puerto Rico; and Honolulu, Hawaii. The gardener should be sure that the overseas nursery is willing to ship, then write to the Plant Protection and Quarantine Programs, Animal and Plant Health Inspection Service (APHIS), U.S. Dept. of Agriculture, Federal Building, Hyattsville, Md. 20782, giving the names of plants he wishes to import and the address of the overseas nursery. If permission is given, the gardener will receive a permit and import labels addressed to the inspection station for the use of the overseas shipper, as well as any instructions for the shipper. Canadians who wish to import plants should write to the Plant Protection Division, Dept. of Agriculture, Ottawa, Ontario K1A 0C5. Importing plants from Canada (or from the U.S. to Canada) is generally less complicated; information can be obtained from the U.S. and Canadian addresses given above. For U.S. gardeners a brochure "Shipping Foreign Plants Home" gives additional permit information as well as plant buying and handling tips. Single copies can be obtained from Information Division, APHIS, U.S. Dept. of Agriculture, 26 Federal Plaza (Rm. 1653), New York, N.Y. 10007. ☙

RETAIL NURSERY SOURCES

Retail nurseries, including those with mixed retail-wholesale operations, are given **letter codes.** Exclusively wholesale nurseries, designated by **number codes,** are listed separately. *If you are not a nurseryman, please do not order directly from wholesale firms.* In the few instances where only wholesale sources have been given for plants, ask your local nurseryman or garden center to order them for you from the particular wholesale firm. All firms listed will ship unless otherwise noted.

Adams Nursery, P.O. Box 606, Springfield Rd., Westfield, Massachusetts 01085. (413) 562-3644. Retail and wholesale. General nursery stock. Catalog.

AE Alberta Nurseries & Seeds, Ltd., Box 20, Bowden, Alberta, Canada T0M 0K0. (403) 224-3362. Retail and wholesale. Ornamental and fruit trees. Vegetable and flower seed. Catalog. Does not ship nursery stock or bulbs to U.S.

J. Herbert Alexander, 1224 Wareham St., Middleboro, Massachusetts 02346. (617) 947-3397. Lilacs, blueberries. Descriptive mail-order list.

AL Alpenglow Gardens (Michaud & Co.) 13328 King George Highway, Surrey, British Columbia, Canada V3T 2T6. (604) 581-8733. Rock garden plants, dwarf conifers. Mail-order catalog $1.00.

Armstrong Nurseries, P.O. Box 4060, Ontario, California 91761. (714) 984-1211. Retail and wholesale. Hybrid tea and other roses. Fruit trees. Mail-order catalog.

Arrowhead Gardens, 115 Boston Post Rd., Wayland, Massachusetts 01778. (617) 235-9520. Retail and wholesale. Garden center; general nursery stock. No shipping; will deliver in area. Catalog 50¢.

BA Bachman's, Inc. 6010 Lyndale Ave. South, Minneapolis, Minnesota 55423. (612) 861-7600. Retail and wholesale. Garden centers. General nursery stock. Retail catalog.

BL Baldsiefen Nursery, Box 88, Bellvale, New York 10912. (914) 986-4222. Azaleas and rhododendrons. Mail-order catalog $2.00. Nursery not open to visitors.

BN Beaverlodge Nursery, Ltd., Box 127, Beaverlodge, Alberta, Canada T0H 0C0. (403) 354-2195. Retail and wholesale. Hardy trees, shrubs and perennials for northern gardens.

BO Bountiful Ridge Nurseries, Princess Anne, Maryland 21853. (301) 651-0400. Retail and wholesale. Fruit and nut trees, berry plants and ornamentals. Mail-order catalog.

BP The Bovees Nursery, 1737 S.W. Coronado, Portland, Oregon 97219. (503) 244-9341. Uncommon rhododendron and azalea species and hybrids. Catalog 50¢. Closed Monday and Tuesday.

BT Bunting's Nurseries, Selbyville, Delaware 19975. (302) 436-8231. Retail and wholesale. Strawberries, fruit and nut trees, ornamentals. Mail-order catalog.

Burgess Seed and Plant Co., P.O. Box 3000, Galesburg, Michigan 49053. Fruit and nut trees, berry plants. ornamentals. Vegetable and flower seeds. Garden supplies. Mail-order catalog.

BU W. Atlee Burpee Co., 300 Park Ave., Warminster, Pennsylvania 18974. (215) 674-4900. Branches in Clinton, Iowa, and Riverside, California. Vegetable and flower seeds, general nursery stock. Trees and shrubs sold retail. Mail-order catalog.

CA California Nursery Co., P.O. Box 2278, Fremont, California 94536. (415) 797-3311. Retail and wholesale. Fruit, nut and ornamental trees. Berry plants. General catalog. Ships retail.

CB Carroll Gardens, 444 E. Main St., Westminster, Maryland 21157. (301) 848-5422. Retail and wholesale. Dwarf evergreens, trees and shrubs, roses, perennials, herbs and ground covers. Catalog.

CH Cherry Hill Nurseries, West Newbury, Massachusetts 01985. (617) 462-6688. Retail and wholesale. General stock. Does not ship. Delivery arranged in area.

CO John Connon Nurseries, Box 200, Waterdown, Ontario, Canada L0R 2H0. (416) 689-4631. Retail and wholesale. General nursery stock. Mail-order catalog $1.00. No retail shipping outside of Canada.

CR Corliss Bros., Essex Rd., Ipswich, Massachusetts 01938. (617) 356-5422. Retail and wholesale. General nursery stock, including specimen size. Does not ship. Delivery within 25 miles.

DA Dauber's Nurseries, 1705 N. George St., Box 1746, York, Pennsylvania 17405. (717) 764-4553. Retail and wholesale. Garden center. Uncommon trees and shrubs, often landscape size. Hollies. Catalog. Does not ship.

Sam Dible Nursery, R.F.D. 3, Box 86, Shelocta, Pennsylvania 15774. (412) 726-5377. Retail and wholesale. Evergreens for Christmas tree plantings, reforestation.

DI Dilatush Nursery, R.R. 4, Robbinsville, New Jersey 08691. (609) 585-5387. Dwarf evergreens and uncommon trees and shrubs. Closed July and August. No shipping.

DU Dutch Mountain Nursery, Augusta, Michigan 49012. (616) 731-5232. Trees and shrubs for wild-life plantings. Price list 25¢

EA Eastern Shore Nurseries, P.O. Box 743, Rte. 331, Easton, Maryland 21601. (301) 822-1320. Retail and wholesale. General nursery stock, mostly container-grown and B & B. Catalog. Does not ship.

EI Eisler Nurseries, Box 70, 219 E. Pearl St., Butler, Pennsylvania 16001. (412) 287-3703. General nursery stock with emphasis on landscape size. Garden supplies. Retail catalog, with price adjustment for trade customers. Shipping in truckload quantities only.

EM Emlong Nurseries, Stevensville, Michigan 49127. (616) 429-3431. Retail, limited wholesale. Garden center. General nursery stock. Fruit trees. Mail-order catalog.

FA Farmer Seed and Nursery Co., Rte. 60, Faribault, Minnesota 55021. (507) 334-6421. Twelve stores in Minnesota. General nursery stock, vegetable and flower seeds. Mail-order catalog.

FE Earl Ferris Nursery, 811 Fourth St., N.E., Hampton, Iowa 50441. (515) 456-2563. Retail and wholesale. Garden center. General nursery stock. Mail-order catalog.

Henry Field Seed and Nursery Co., 407 Sycamore St., Shenandoah, Iowa 51602. (712) 246-2110. Retail and wholesale. General nursery stock. Mail-order catalog.

FO Fiore Enterprises, Rte. 22, Prairie View, Illinois 60069. (312) 634-3400. Retail; also wholesale as Charles Fiore Nurseries. Trees and shrubs, mainly of landscape size. Separate retail and wholesale catalogs.

Flickingers' Nursery, Sagamore, Pennsylvania 16250. (412) 783-6528. Retail and wholesale. Evergreen seedlings for Christmas trees and reforestation. Catalog.

Game Food Nurseries, Box V, Omro, Wisconsin 54963. (414) 685-2929. Retail and wholesale. Wild rice; other marsh and upland plants for gamebirds. Seeds. Catalog $1.00.

The Garden Spot, 4032 Rosewood Dr., Columbia, South Carolina 29205. (803) 787-7463. Cuttings and plants of 100 kinds of English ivy (*Hedera helix*). Self-addressed, stamped envelope for list.

GA Gardens of the Blue Ridge, P.O. Box 10, Rte. 221, Pineola, North Carolina 28662. (704) 756-4339. Retail, limited wholesale. Native trees and shrubs, wide selection of wildflowers. Catalog.

D. S. George Nurseries, 2491 Penfield Rd., Fairport, New York 14450. (716) 377-0731. Retail and wholesale. Clematis. List.

GI Girard Nurseries, P.O. Box 428, Geneva, Ohio 44041. (216) 466-2881. Retail and wholesale. Dwarf and unusual evergreens, azaleas, uncommon trees. Prebonsai conifers. Conifer seeds. Mail-order catalog.

GO Gossler Farms Nursery, 1200 Weaver Rd., Springfield, Oregon 97477. (503) 746-3922. Rare magnolias. Trees chosen for bark character. Unusually refined selection. Catalog 50¢.

GR Greer Gardens, 1280 Goodpasture Island Rd., Eugene, Oregon 97401. (503) 686-8266. Rhododendrons, azaleas, Japanese and other maples. Catalog.

GS Griffey's Nursery, Rte. 3-B 17A, Marshall, North Carolina 28753. (704) 656-2334. Retail and wholesale. Southern native trees, shrubs and wildflowers.

GU Gurney Seed & Nursery Co., Yankton, South Dakota 57078. (605) 665-4451. Vegetable and flower seeds. Trees and shrubs for the Plains. Perennials; garden supplies. Mail-order catalog.

HA H. G. Hastings Co., Box 4274, Atlanta, Georgia 30302. (404) 524-8861. Retail and wholesale; also garden centers. Camellias, azaleas and other broad-leaf evergreens for the South. Roses, bulbs, vegetable and flower seeds. Fruit trees; ornamental trees and shrubs. Catalog.

HE Heard Gardens, 5355 Merle Hay Rd., Des Moines, Iowa 50323. (515) 276-4533. Retail and wholesale. Trees and shrubs of landscape size. Large selection of lilacs and crab-apples. Limited shipping.

HF Thomas Henny Nursery, 7811 Stratford Dr., N.E., Brooks, Oregon 97305. (503) 792-3376. Retail, with quantity discount. Gable and Glenn Dale azaleas; also a good selection of rhododendrons. Catalog.

Hillier & Sons, Winchester, England. The largest selection of woody plants grown anywhere by a commercial firm. Its *Manual of Trees & Shrubs* ($6 soft cover, $14 hard bound) is a valuable reference for descriptions of uncommon plants. Import permits needed (see page 82).

HG C. M. Hobbs & Sons, 9300 W. Washington St., Indianapolis, Indiana 46231. (317) 241-9253. Retail and wholesale. Trees and shrubs, often of landscape size. Catalog available, but no mail-order.

HH Holly Heath Nursery, Rte. 25A, Wading River, New York. (Mailing address—Box 55A, Calverton, N.Y. 11933.) (516) 727-0859. Retail operation has wide selection of azaleas. Rhododendrons, hollies, dwarf conifers. Wholesale limited to lining out stock. Catalog $1.00, refundable with order.

Hollyland U.S.A., P.O. Box 754, Millville, New Jersey 08332. (609) 825-4959. Retail and wholesale. Rooted cuttings shipped, but larger hollies must be picked up at nursery. Cut holly at Christmas season. Price list.

HO Hortica Gardens, Box 308, 6309 Green Valley Rd., Placerville, California 95667. (916) 662-7089. Retail; discount to dealers. Nursery stock suitable for bonsai training or garden planting. Catalog 25¢, refundable with order. Visitors by appointment.

Indian Run Nursery, Allentown Rd., Robbinsville, New Jersey 08691. (609) 259-2600. Rhododendrons. No current catalog, but they have about 400 varieties, so send a "want" list. Nursery open Tues.-Sat. mornings or by appointment. Does not ship.

IN Inter-State Nurseries, Hamburg, Iowa 51640. (712) 382-2411. General nursery stock, fruit trees, perennials. Mail-order catalog.

IS Island Gardens, 701 Goodpasture Island Rd., Eugene, Oregon 97401. (503) 343-4711. Retail and wholesale. Azaleas and rhododendrons.

Jackson & Perkins Co., 1 Rose Lane, Medford, Oregon 97501. (503) 776-2000. Mostly retail; wholesale for roses only. Roses, bulbs, dwarf fruit trees, flower and vegetable seeds. Catalog.

JA Jamieson Valley Gardens, Jamieson Rd., Rte. 3, Spokane, Washington 99203. Retail mail-order only. Uncommon rock garden plants, western native plants. Catalog $1.00.

Keil Bros., 220-15 Horace Harding Blvd., Bayside, New York 11364. (212) 229-5042. Dwarf plants, heaths and heathers, rock garden plants, general and unusual nursery stock. Does not ship. Delivery to borough of Queens.

KE Kelly Bros. Nurseries, Dansville, New York 14437. (716) 987-2211. General nursery stock, fruit and nut trees, bulbs. Mail-order catalog.

KG Joseph J. Kern Rose Nursery, Box 33, Jackson St. at Heisley Rd., Mentor, Ohio 44060. (216) 255-8627. Old and new roses. Visitors June-October by appointment. No catalog; write for availability.

Kimberly Barn Floral, Garden and Landscape Center, 1221 E. Kimberly Rd., Davenport, Iowa 52807. (319) 386-1308. General nursery stock. Does not ship.

KI Rudolph Kluis Nursery, Box 116, Ryan Rd., Marlboro, New Jersey 07746. (201) 462-4694. Dwarf conifers, hard-to-find shrubs. Catalog 25¢. Does not ship or deliver. Visitors by appointment only.

KM Michael A. Kristich, Stonhedge, R.D. #1, Wellsville, Pennsylvania 17365. (717) 292-2962. Retail, limited wholesale. Extensive selection of Japanese maples and conifers, including dwarfs. Visitors by appointment only. Will ship but encourages inspection of rare plants.

KR Krider Nurseries, Middlebury, Indiana 46540. (219) 825-5714. Retail and wholesale. Fruit trees, ornamental trees and shrubs. Mail-order catalog.

KS Kroh Nurseries, Box 536, Loveland, Colorado 80537. (303) 667-2443. Retail and wholesale. Ornamental trees and shrubs for the Rocky Mountains. Fruit trees, roses. Larger specimens at nursery. Catalog.

LA LaBars' Rhododendron Nursery, Box 111, Stroudsburg, Pennsylvania 18360. (717) 421-5880. Retail and wholesale. Landscape-size trees and shrubs available at the nursery. Mail-order catalog for rhododendrons and other ericaceous plants.

LC LaFayette Home Nursery, Box 1A, R. R. #1, LaFayette, Illinois 61449. (309) 995-3311. Retail and wholesale. Extensive selection of trees and shrubs, many in large specimen size. Lengthy retail price list.

LE Lamb Nurseries, E. 101 Sharp Ave., Spokane, Washington 99202. (509) 328-7956. Dwarf shrubs, rock garden plants, perennials, ground covers, hardy succulents. Mail-order catalog.

LG H. L. Larson, 3656 Bridgeport Way, Tacoma, Washington 98466. (206) 564-1488. Seeds of uncommon rhododendron species. No plants shipped. List.

A. M. Leonard, Inc., 6665 Spiker Rd., P.O. Box 816, Piqua, Ohio 45356. (513) 773-2694. Gardening and pruning tools. Extensive catalog.

Henry Leuthardt Nurseries, Montauk Hwy., East Morishes, New York 11940. (516) 878-1387. Dwarf and espaliered fruit trees. Catalog 25¢.

LI Light's Landscape Nurserymen, 9153 East D Ave., Richland, Michigan 49083. (616) 629-9761. Retail and limited wholesale. Wide range of trees and shrubs, including specimen size. Catalog. No shipping but delivery can be arranged in area.

LL Little Lake Nursery, Rte. 2, Box 2503E, Auburn, California 95603. Wide selection of lilacs, flowering quinces (*Chaenomeles*) and magnolias. Catalog 35¢. Visitors by appointment.

LT Littlefield-Wyman, Inc. 227 Centre Ave., Abington, Massachusetts 02351. (617) 878-1800. Retail and wholesale. General nursery and garden center. Landscape-size trees and shrubs, evergreens. Catalog.

MA McKay Nursery Co., 254 Jefferson St., Waterloo, Wisconsin 53594. (414) 478-2121. (Offices in Milwaukee and Madison.) Retail and wholesale. General nursery stock, specimen-size trees and shrubs. Landscape catalog.

May Nursery Co., Box 1312, 2115 Lincoln Ave., Yakima, Washington 98907. (509) 453-8219. Fruit and nut trees, berry plants retail. Also trees and shrubs wholesale. Separate catalogs.

MB Earl May Seed & Nursery Co., 100 N. Elm St., Shenandoah, Iowa 51601. (712) 246-1020. Primarily retail. 42 garden centers in four state area. General nursery stock, fruit trees, flower and vegetable seeds. Mail-order catalog.

ML Mellingers, Inc., 2310 West South Range, North Lima, Ohio 44452. (216) 549-9861. Retail and wholesale. Extensive variety of trees and shrubs in small sizes. Prebonsai. Tree seeds. Unusually large list of garden supplies and tools. Reference books. Mail-order catalog.

MN Miniature Gardens, Box 757, Stony Plain, Alberta, Canada T0E 2G0. (403) 963-3447. Dwarf conifers and other uncommon dwarf plants. Mail-order catalog.

MU Musser Forests, Inc., Box 340, Rte. 119, Indiana, Pennsylvania 15701. (412) 456-5686. Retail and wholesale. Conifers in quantity units for Christmas tree plantings and reforestation. Deciduous trees, flowering shrubs. Mail-order catalog.

NE Neosho Nurseries, 900 North College, Neosho, Missouri 64850. (417) 451-1212. Retail and wholesale. General nursery stock, fruit and nut trees, roses. Gardening supplies. Catalog 50¢.

NU Nuccio's Nurseries, 3555 Chaney Trail, Altadena, California 91001. (213) 794-3383. Extensive camellia listing. Azaleas. Nursery closed Wednesday and Thursday. Catalog.

OL Oliver Nurseries, 1159 Bronson Rd., Fairfield, Connecticut 06430. (203) 259-5609. Dwarf conifers and rock garden plants. Rhododendrons. Uncommon trees. Prebonsai plants. Catalog 50¢. Does not ship.

PA Palette Gardens, 26 W. Zion Hill Rd., Quakertown, Pennsylvania 18951. (215) 536-4027. Retail, limited wholesale. Dwarf conifers, Japanese maples. Uncommon rock garden perennials, trees. Some specimen trees available at nursery. Catalog 50¢.

Panfield Nurseries, 322 Southdown Rd., Huntington, New York 11743. (516) 427-0112. Wholesale branch at Mt. Sinai-Coram Rd., Mt. Sinai, N.Y. (516) 473-9170. Extensive selection of trees, shrubs and woodland plants. Wholesale catalog only. Does not ship trees and shrubs.

George W. Park Seed Co., P.O. Box 31, Greenwood, South Carolina 29647. (803) 451-3341. Retail and wholesale vegetable and flower seeds. Mail-order catalog.

PN Patmore Nursery Sales, Box 582—18th St., Brandon, Manitoba, Canada R7A 5Z7. (204) 728-1321. Retail nursery stock for the Northern Plains. Does not ship.

Pellett Gardens, Atlantic, Iowa 50022. (712) 243-1917. Honey plants. Mail-order catalog.

PR Perry's Plants, 19362 Walnut Dr., La Puente, California 91745. (213) 964-1285; (714) 595-2261. Also in Carpinteria and Fremont, California, and in Phoenix, Arizona. Retail and wholesale. Ground covers in quantity units. Catalog.

PT Peters & Wilson Nursery, 11 Rollins Rd., Millbrae, California 94030. (415) 697-5373. Garden center. Closed Wednesday. Wide selection of ornamental trees and shrubs for southern California. Catalog $1.00.

PV Plumfield Nurseries, Box 410, Fremont, Nebraska 68025. (402) 721-3622. Garden center at 735 W. 23rd St. (721-3520). Retail orders through garden center, wholesale orders through nursery. General stock. Separate retail and wholesale lists.

PW Orlando S. Pride Nurseries, P.O. Box 1865, 145 Weckerly Rd., Butler, Pennsylvania 16001. (412) 283-0962. Retail and wholesale. Azaleas, hollies, rhododendrons, others. B & B stock, some specimen size. Ships small plants. Catalog.

Putney Nursery, Putney, Vermont 05346. (802) 387-5577. Garden center. Wildflowers, ferns, perennials. Woody plants available only at the nursery. Mail-order catalog.

RA Rainier Mt. Alpine Gardens, 2007 S. 126th St., Seattle, Washington 98168. (206) 242-4090. Dwarf conifers. Wide selection of unusual rhododendrons. Catalog.

RF Raraflora, 1195 Stump Rd., Feasterville, Pennsylvania 19047. (215) 357-3791. Extensive selection of dwarf conifers. Japanese maples, uncommon trees and shrubs. Plant list 25¢. Will ship but encourages pickup at nursery. Visitors by appointment only.

Rayner Bros., P.O. Box 1617, Salisbury, Maryland 21801. (301) 742-1594. Fruit and nut trees, strawberries, other berry plants. Mail-order catalog.

Clyde Robin Seed Co., Box 2091, Castro Valley, California 94546. (415) 581-3467. Seeds of native trees, shrubs and wildflowers. Mail-order catalog.

RG The Rock Garden, R.F.D. 2, Litchfield, Maine 04350. Dwarf conifers and other dwarf shrubs and rock garden plants. Visitors by appointment only. Mail-order catalog 40¢.

RH Rose Hill Nursery, 2380 W. Larpenteur Ave., St. Paul, Minnesota 55113. (612) 646-7541; also at E. Hennepin & Fuller, Minneapolis. General stock, fruit trees. Catalog.

RO Rosedale Nurseries, Saw Mill River Pkwy., Hawthorne, New York 10532. (914) 769-1300. Large selection of general nursery stock, including trees of landscape size. Does not ship but will deliver in the area.

SA Scarff's Nursery, 411 Dayton Lakeview Rd., New Carlisle, Ohio 45344. (513) 845-2551. Retail and wholesale. General nursery stock, container plants. Wholesale catalog only.

SE A. Shammarello & Son Nursery, 4508 Monticello Blvd., South Euclid, Ohio 44143. (216) 381-2510. Rhododendrons and azaleas. Catalog.

SH Sheridan Nurseries, 700 Evans Ave., Etobicoke, Ontario, Canada M9C 1A1. (416) 621-9111. Orders from Quebec should be addressed to 650 Montée de Liesse, Montreal, Quebec H4T 1N8. Retail and wholesale. Six garden centers in Ontario and Quebec. Wide selection of general nursery stock, perennials, roses. Landscape catalog $1.00 in Canada, $2.00 to United States.

SG The Shop in the Sierra, Box 1, Midpines, California 95345. (209) 966-3867. Western native trees and shrubs. Catalog $1.00.

SI Silver Falls Nursery, P.O. Box 84, Silverton, Oregon 97381. Large selection of unusual conifers, shrubs and trees. Christmas trees and plants suitable for bonsai initiation. Mail-order catalog 25¢.

SJ Francis M. Sinclair, R.F.D. 1, Newmarket Rd., Exeter, New Hampshire 03833. (603) 772-2362. Wildflowers retail. Also native trees and shrubs wholesale. Material collected from the wild. Price list.

SK Siskiyou Rare Plant Nursery, 522 Franquette St., Medford, Oregon 97501. (503) 772-6050. Dwarf shrubs, rare alpine plants. Catalog 50¢.

SL Joel W. Spingarn, 1535 Forest Ave., Baldwin, New York 11510. (516) 623-7810. Extensive selection of dwarf conifers. Japanese maples, rock garden rhododendrons. Catalog 50¢. Visitors by appointment only.

Sprainbrook Nursery, Inc. 448 Underhill Rd., Scarsdale, New York 10583. (914) 723-2382. Ornamental trees and shrubs, conifers, perennials. Catalog, but no shipping.

SN Spring Hill Nurseries, Elm St., Tipp City, Ohio 45371. (513) 667-2491. Retail and wholesale. General stock, perennials, ground covers, vines. Mail-order catalog.

SP Spruce Brook Nursery, P.O. Box 925, Rte. 118, Litchfield, Connecticut 06759. (203) 482-5229. General stock, including dwarf rhododendrons. Fruit trees, perennials. Catalog $2.00, refundable with order.

SQ Squirrel Hill Nursery, 2945 Beechwood Blvd., Pittsburgh, Pennsylvania 15217.

(412) 421-1900. Retail and wholesale. General nursery stock. Catalog. Does not ship but will deliver in Pittsburgh area.

SS Star Roses (Conrad-Pyle Co.), West Grove, Pennsylvania 19390. (215) 869-2426. Retail and wholesale. Garden centers in West Grove and Lancaster offer a wide range of shrubs and trees, besides roses. Catalog (mainly roses). Wholesale catalog lists roses and general stock.

ST Stark Bro's. Nurseries, Louisiana, Missouri 63353. (314) 754-5511. Large selection of fruit trees. Ornamental shrubs and trees. Mail-order catalog.

Stern's Nurseries, Geneva, New York 14456. (315) 789-7371. General nursery stock, including fruit plants, roses and perennials. Mail-order catalog 50¢.

SW Sweet Gum Farm, Rte. 2, Alma, Georgia 31510. (912) 449-4359. Wide selection of species and hybrid azaleas. Catalog.

Sylvan Nursery, 1028 Horseneck Rd., South Westport, Massachusetts 02790. (617) 636-4573. Heaths, heathers, seashore plants. List.

TA Tall Timber, 4520 Lariat Drive, Castle Rock, Colorado 80140. (303) 688-3664. General stock, including plants suitable for bonsai. Mail-order catalog 50¢, refundable with order.

TH Thomasville Nurseries, Box 7, 1842 Smith Ave., Thomasville, Georgia 31792. (912) 226-5568. Retail, limited wholesale. Roses, daylilies, liriopes. Mail-order catalog.

TI Tillotson's Roses, 992 Brown's Valley Rds., Watsonville, California 95076. (408) 724-3537. Extensive selection of old-fashioned and modern roses. Catalog $1.00, refundable with order.

TL Tingle Nursery Co., Pittsville, Maryland 21850. (301) 835-2101. Retail and wholesale. Evergreen azaleas, hollies, ornamental trees and shrubs. Lining out and specimen stock.

William Tricker, Inc., 74 Allendale Ave., Saddle River, New Jersey 07458. (201) 327-0721; also 7125 Tanglewood Dr., Independence Ohio 44131. (216) 524-3491. Water lilies and bog plants. Catalog.

VA Valley Nursery, Box 4845, Helena, Montana 59601. (406) 442-8460. Retail and wholesale. Uncommon trees and shrubs for cold climates. Plant list.

VI Martin Viette Nurseries, Rte. 25A (Northern Blvd.), Muttontown, New York 11732. (516) 922-5530. Retail and wholesale. Extensive stock, including an unusually wide range of perennials and wildflowers. Catalog 50¢.

WA Watnong Nursery, The Don Smiths, Morris Plains, New Jersey 07950. (201) 539-0312. Extensive selection of dwarf evergreens, rare shrubs and trees. Container-grown. Does not ship. Open by appointment only.

WB Waynesboro Nurseries, Box 987, Lyndhurst-Sherando Lake Rd., Waynesboro, Virginia 22980. (703) 942-4141. Retail and wholesale. General nursery stock, fruit trees, berry plants. Large trees available at nursery. Mail-order catalog.

WC Wayside Gardens, Hodges, South Carolina 29695. Retail and wholesale. Wide range of shrubs, vines, perennials. Catalog $1.00, refundable with order.

WD Warren & Son Nursery, 10901 N.E. 23rd. Oklahoma City, Oklahoma 73161. (405) 769-2678. Retail and wholesale. Redbuds (*Cercis*).

Western Maine Forest Nursery Co., 36 Elm St., Fryeburg, Maine 04037. (207) 935-2165. Retail and wholesale. Small-size conifers in quantity units for Christmas tree plantations and reforestation.

WE Weston Nurseries, E. Main St., Hopkinton, Massachusetts 01748. (617) 435-3414; from Greater Boston: 235-3431. Retail and wholesale. General nursery stock, perennials, rock garden plants. Landscape-size trees and shrubs. Catalog. Does not ship but will deliver within 50 miles of Boston.

WF White Flower Farm, Rte. 63, Litchfield, Connecticut 06759. (203) 567-9415. Perennials, bulbs, uncommon trees and shrubs. Yearly catalog subscription $4.00, refundable with order.

WI The Wild Garden, Box 487, Bothell, Washington 98011. Retail and wholesale. Large variety of hard-to-find rock garden plants. Catalog $1.00. Mail-order sales only.

Windsor Road Nursery, Rte. 12A, Claremont, New Hampshire. (Mailing address: R.F.D. 2, Windsor, Vermont 05089.) (603) 543-3239. General nursery stock, roses. Does not ship.

WY Melvin E. Wyant Rose Specialist, Johnny Cake Ridge, Rte. 84, Mentor, Ohio 44060. (216) 255-2553. Retail and wholesale. Old-fashioned and new roses. Also miniature roses. Mail-order catalog.

YB Yerba Buena Nursery, 19500 Skyline Blvd., Woodside, California 94062. (415) 851-1668. Retail and wholesale. California native trees and shrubs. Plant list.

ZI Zilke Brothers Nursery, Box 8, Baroda, Michigan 49101. (616) 422-1651. General stock, fruit trees, berry plants. Specimen sizes at nursery. Mail-order catalog.

WHOLESALE NURSERIES

The following firms are not equipped to deal directly with the gardening public, except where noted. This list is primarily for nurserymen. If you desire a plant that is available only from a wholesale source, please ask your local nurseryman to order it for you.

1 American Garden Cole, 30627 Orr Rd., Circleville, Ohio 43113. (614) 477-1671. Shade trees, flowering trees and shrubs.

2 Appalachian Nurseries, Box 87, Fairview Ave., Waynesboro, Pennsylvania 17268. (716) 762-4733. Lining out stock of uncommon shrubs and trees. Azaleas and rhododendrons. Catalog.

3 Bagatelle Nursery, Box 606, Center Moriches, New York 11934. (516) 878-1717. Nursery at Head of the Neck Rd., East Moriches. General stock.

4 Boething Treeland Nursery Co., 23475 Long Valley Rd., Woodland Hills, California 91364. (213) 883-1222. Container-grown trees and shrubs for mild climates. No shipping but will deliver.

5 Bosley Nurseries, 9579 Mentor Ave., Mentor, Ohio 44060. (216) 352-3308. Hollies, ericaceous plants. Flowering shrubs. Container stock.

6 Burr Oak Nursery, Rte. 1, Box 310, Round Lake, Illinois 60073. General B & B and container-grown stock, including specimen sizes. Catalog. Outside trucking can be arranged.

7 Curtis Nurseries, P.O. Box 277, Bridge St., Callicoon, New York 12723. (914) 887-4400. General nursery stock, native rhododendrons and hemlocks.

8 Environmentals, James E. Cross, Box 730, Cutchogue, New York 11935. (516) 734-6439. Box huckleberry and other dwarf broadleaf evergreens. Dwarf conifers. Container stock. Does not ship.

9 F & F Nurseries, Roberts Rd., Holmdel, New Jersey 07733. (201) 946-4500. General stock, *Taxus*. Catalog available to trade only. Does not ship.

10 Forest Nursery Co., Rte. 2, Box 118-A, McMinnville, Tennessee 37110. (615) 473-2133. Ornamental trees and shrubs, fruit trees. Larger trees available at nursery. Catalog to the trade only.

11 Forest Hills Nurseries, 301 Knollwood Ave., Cranston, Rhode Island 02910. (401) 944-8282. Nursery on Exeter Rd., N. Kingston (Slocum), 294-2255. Large selection of general nursery stock. Catalog.

12 Gilmore Plant & Bulb Co., P.O. Box 8, Julian, North Carolina 27283. General

nursery stock. Broad-leaf evergreens, fruit trees. Catalog.

13 Calvin Harman Nursery, Stovall, Georgia 30283. (404) 884-8838. Rooted cuttings and liners of evergreen shrubs. Japanese hollies.

14 Hess Nurseries, P.O. Box 326, Rte. 553, Cedarville, New Jersey 08311. (609) 447-4213. Seedlings of uncommon trees and shrubs. Grafts of hard-to-find conifers. Pre-bonsai plants. B & B material.

15 D. Hill Nursery Co., P.O. Box 8, Dundee, Illinois 60118. (312) 426-3451. Conifers, general nursery stock. Ground covers. Containers and B & B. Retail at garden center only.

16 Hollandia Gardens, 10725—39th Ave. N.E., Seattle, Washington 98125. (206) 363-6080. Rare trees and shrubs. B & B and container stock.

17 Ingleside Plantation Nurseries, Oak Grove, Virginia 22443. (804) 224-2042. General nursery stock, broadleaf evergreens. Catalog available only to the trade.

18 K. M. Nursery, Box 847, 5154 Foothill Rd., Carpinteria, California 93013. (805) 684-2318. Mild climate trees and shrubs.

19 Baier Lustgarten, Rte. 25, Middle Island, New York 11953. (516) 924-3444. Branch at Holmes Rd., Cream Ridge, New Jersey 08514. (609) 758-7600. Extensive list of shrubs and trees. Specimen material. Local retail as well as wholesale to various points.

20 Medford Nursery, Eaynestown-Red Lion Rd., R.D. #1, Medford, New Jersey 08055. (609) 267-8100. General nursery stock, container-grown plants. Hollies, junipers.

21 Mitsch Nursery, Rte. 3, Box 400, Aurora, Oregon 97002. (503) 266-9652. Lining out stock of conifers, rhododendrons, camellias, heaths and heather, broadleaf evergreens. Wide selection. Catalog $2.00, refundable with order.

22 Monrovia Nursery Co., P.O. Box Q, Azusa, California 91702. (213) 334-9321. Unusually wide range of general nursery stock for moderate and mild climates. Container stock, also smaller sizes. Catalog $5.00, to the trade only.

23 Mount Arbor Nurseries, P.O. Box 129, Shenandoah, Iowa 51601. (712) 246-4250. General nursery stock, roses, peonies. Catalog. Owner of Shenandoah Nurseries.

24 Mountain Home Nurseries, De Borgia, Montana 59830. (406) 678-4221. Christmas tree seedlings.

25 Phyto-ecology, P.O. Box 303, Ridgely, Maryland 21660. (301) 634-2526. Dwarf conifers, rhododendrons.

26 Phytotektor, Inc., Box 99, Winchester, Tennessee 37398. (615) 967-2432. Rooted cuttings and liners of flowering quinces, hollies, junipers. Uncommon plants.

27 Princeton Nurseries, Box 191, Princeton, New Jersey 08540. (609) 924-1776. General nursery stock, including some specimen sizes. B & B and container stock. Catalog $1.00, available to the trade only.

28 Edward H. Scanlon & Assoc., 7621 Lewis Rd., Olmsted Falls, Ohio 44138. (216) 235-3314. Street trees selected for special growth habits. Uncommon trees. flowering cherries, crab-apples.

29 Select Nurseries, 12831 E. Central Ave., Brea, California 92621. (714) 529-3711. (213) 691-7753. Large selection of general nursery stock for mild climates. Topiary and espaliers. Container-grown material. Catalog $3.00, to the trade only.

30 Shenandoah Nurseries, Box 99, 301 Wabash Ave., Shenandoah, Iowa 51601. (712) 246-3563. General stock, fruit trees, berry plants, roses. Growing guides to retailers.

31 Simpson Orchard Co., 1504 Wheatland Rd., Vincennes, Indiana 47591. (812) 882-2441. Hollies, crab-apples, hawthorns.

32 Summer Hill Nursery, Summer Hill Rd., Madison, Connecticut 06443. (203) 421-3055. General nursery stock, conifers, rhododendrons. B & B and container stock.

33 Alfred Teufel Nursery, 12345 N.W. Barnes Rd., Portland, Oregon 97229. (503) 646-1111. Branch at 666-134th St. S.W., Everett, Washington 98204 (206) 337-1333. Broadleaf evergreens, including hollies. Ground covers. Fruit trees. Nursery and greenhouse supplies. Catalog $2.50, to the trade only.

34 Van Veen Nursery, 4201 S.E. Franklin St., Portland, Oregon 97206. (503) 777-1734. Large selection of rhododendrons. Catalog.

35 Vans Pines, Inc., West Olive, Michigan 49460. (616) 399-1620. Seedlings and transplants of conifers and deciduous trees and shrubs. Catalog.

36 John Vermeulen & Son, Inc., Box 267N, Woodfern Rd., Neshanic Station, New Jersey 08853. (201) 369-5211. Liners and container stock of uncommon trees and shrubs. Dwarf conifers, azaleas, broadleaf evergreens. Pre-bonsai and bonsai. Unrooted cuttings and scions. Landscape material.

37 Viewcrest Nurseries, 9617 N.E. Burton Rd., Vancouver, Washington 98662. (206) 892-4942. Seedling and transplants of shade and flowering trees and conifers.

38 Warren County Nursery, Box 204, Rte. 2, McMinnville, Tennessee 37110. (615) 668-8941. Liners and larger sizes of ornamental trees and shrubs. Fruit and nut trees.

39 Westminster Nurseries, P.O. Box 227, Westminster, Maryland 21157. (301) 848-9444. Conifers and broadleaf evergreens. Flowering trees and shrubs.

40 Wight Nurseries, Cairo, Georgia 31728. (912) 337-3033. B & B and container conifers and broadleaf evergreens. Espaliered specimens.

41 Woodland Nurseries, 2151 Camilla Rd., Mississauga, Ontario, Canada L5A 2K1. (416) 277-2961. Mostly wholesale. Nursery and lining out stock of rhododendrons, azaleas and allied plants. Catalog.

42 Verkade's Nurseries, 262 Back Oak Ridge Rd., Wayne, New Jersey 07470. (201) 694-0304. Nursery and lining out stock of unusual conifers and ornamentals. Scions available. Catalog to the trade only.

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AN INVITATION TO JOIN AND ENJOY

A man does not plant a tree for himself;
he plants it for posterity.
—Alexander Smith

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PLANTS & GARDENS

SMALL GARDENS for SMALL SPACES

- Flowers, Trees, Shrubs
- Vegetables, Herbs
- Landscape Plans and Ideas
  - —City, Suburb, Country
  - —Answers for Difficult Sites

A HANDBOOK

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AMONG OUR CONTRIBUTORS

Henry B. Aul, Hershey, Pennsylvania, writes a regular garden column for the New York "Daily News." Former garden editor, New York "Herald Tribune." Author of several books, including *How to Plan Modern Home Grounds* (Sheridan House, Yonkers, New York).

Charles Marden Fitch, Mamaroneck, New York, is a photographer-naturalist interested in ornamental plants of the tropics. Author of several books on indoor-plant subjects. His latest work is *The Complete Book of Miniature Roses* (Hawthorn Books, New York).

William Flemer, III, President of Princeton Nurseries, Princeton, New Jersey, a wholesale firm specializing in ornamental trees and shrubs. Past president, American Association of Nurserymen. Author of *Nature's Guide to Successful Gardening and Landscaping* (Thomas Y. Crowell Co., New York).

H. Lincoln Foster, Falls Village, Connecticut. A landscape designer, lecturer and plant hunter, he has a keen interest in alpines. Past president, American Rock Garden Society. Author of *Rock Gardening* (Houghton Mifflin Co., Boston).

James J. Franklin, Education Department, Callaway Gardens, Pine Mountain, Georgia. Until recently Associate Professor of Horticulture, Florida A & M University, Tallahassee. Former Assistant to the Director, Brooklyn Botanic Garden.

Paul F. Frese, White Plains, New York, is a gardener, lecturer, photographer and writer. Director Emeritus, Meyer Arboretum, Ward Pound Ridge Reservation, Westchester County, N.Y. Author and past editor of several periodicals, including *Flower Grower* and *Plants & Gardens*. Guest Editor of this Handbook.

Joseph Hudak, Vice President, Olmsted Associates, Inc., Brookline, Massachusetts, is a well-known landscape architect. Author of *Gardening with Perennials Month by Month* (Quadrangle/New York Times Book Co., N.Y.).

Gordon E. Jones, Director, Planting Fields Arboretum, Oyster Bay, New York, is interested in a variety of woody plants, including hollies, azaleas and dwarf conifers. Guest Editor of the Brooklyn Botanic Garden Handbook, *Rhododendrons and Their Relatives*.

Peter Malins, Rosarian, Brooklyn Botanic Garden. A native of Latvia, he joined the BBG staff in 1949 after receiving a Master's Degree in Agronomy from the Technical University, Munich, Germany.

Charles P. Mazza, Curator of Instruction, Brooklyn Botanic Garden, frequently teaches short-courses on ground covers and other subjects. He also oversees the Children's Garden.

Frederick McGourty, Jr., Editor, PLANTS & GARDENS and Associate Taxonomist, Brooklyn Botanic Garden.

Edmond O. Moulin, Horticulturist, Brooklyn Botanic Garden, is responsible for the care of the 14,000 kinds of plants in the BBG collection.

Quentin C. Schlieder, Jr., Director of Horticulture, Frelinghuysen Arboretum, Morristown, New Jersey. An active member of several plant societies, he has a keen interest in rock garden plants, dwarf conifers and ivies.

Elizabeth Remsen Van Brunt, Kitchawan, Ossining, New York, has fostered many herb gardens, including the one at Brooklyn Botanic Garden. Honorary Curator of Herbs, BBG. Guest Editor, BBG *Handbook on Herbs*.

BROOKLYN BOTANIC GARDEN RECORD

PLANTS & GARDENS

SMALL GARDENS FOR SMALL SPACES

Vol. 33 Autumn (November) 1977 No. 3

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Staff for this issue:
PAUL F. FRESE, *Guest Editor*
FREDERICK MCGOURTY, JR., *Editor*
MARGARET E.B. JOYNER, *Associate Editor*
and the Editorial Committee of the Brooklyn Botanic Garden
VIOLETTE CONNOLLY, *Secretary of Publications*
ELIZABETH SCHOLTZ, *Director, Brooklyn Botanic Garden*

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George Taloumis

The concept of small garden design is well demonstrated in this herb planting in which rosemary, santolina, thyme, rose geranium and basil are neatly arranged.

Letter from the Brooklyn Botanic Garden

Times change, and so do gardens. More and more people are gardening than ever, and they are usually doing it on smaller pieces of land. The ambitious serpentine flower borders of another generation with their large groups of delphinium, bearded iris and summer phlox had a stately grace, but no one but the hired and/or tired gardener knew of the work that into them. Today, because of limited space (and a garden by definition is an enclosure), fewer plants are used, design is simpler—though not less pleasing, and no one need be a slave who doesn't want to be. Enjoyment in tending a garden has returned, and that is as it should be.

Guest Editor Paul Frese, who is well known to P & G readers, has thought of the articles in this Handbook as idea segments, suggesting plants and designs for postage-stamp yards, odd corners, skinny rectangles such as the side of a garage, dry areas, shady sites—places that many people have despaired of as unable to grow anything, much less as beauty spots. Our warmest thanks go to Mr. Frese and his Contributors for giving inspiration to plant the trouble areas.

About ten years ago my neighbor planted a little blue spruce tree next to his back door and I have followed its progress with morbid interest. How innocent it looked while young—as they all do. The first several years he pointed with warm pride to the splendid growth the spruce was making. It was indeed a fine specimen, all glistening and swollen like a pregnant teardrop. More recently, my neighbor had to squeeze sideways through the door, his glowing remarks ceased, and this summer the inevitable came—lower branches completely pruned away on one side. It will be a rump of a tree until removed in another two or three years. I hope the replacement will be a *dwarf* blue spruce, or perhaps a narrow column such as the Skyrocket juniper if my neighbor really prefers the landscape system of dashes and dots.

How long is a garden good for? A friend who has grown dwarf plants for forty years recently lamented that all gardens, large or small, have life spans—an infancy when plants scream for attention, a blossoming if scrawny youth, a fairly long and sedate middle age, a redefined golden maturity, and senescence. His was hovering between the last two and losing the battle despite the relatively slow growth rates of Dopey, Doc, Grumpy and their confrères. Our friend's garden has lasted longer than most because of his careful selection, but even he must dig up an occasional plant to pass over the fence or to give to the BBG benefit Plant Sale!

No garden is forever, and even good small ones must usually be redone every fifteen or twenty years. Perhaps that is just as well, for our own tastes and interests change with time. There is keen satisfaction in the creation of a new garden itself as well as, sometimes, the good feeling of covering one's tracks if something went wrong earlier. What is most important is that the spirit of gardening goes on.

Sincerely,

Frederick McGourty, Jr.

Editor

Careful planning and restraint in . . .

THE SMALL GARDEN

Paul F. Frese

A property of limited size is both a bonanza and a challenge. On one hand, the lack of extensive plantings of trees and shrubs, lengthy flower borders, long stretches of hedges and acres of lawn reduce maintenance to a minimum. However, when gardens are small and limited space brings every plant and landscape feature into sharp focus, each element must be carefully considered—the best use of every inch of land; the selection of plants which by their character and color add distinction to the design; and preserving the neatness and appearance of the entire garden by applying good horticultural practices.

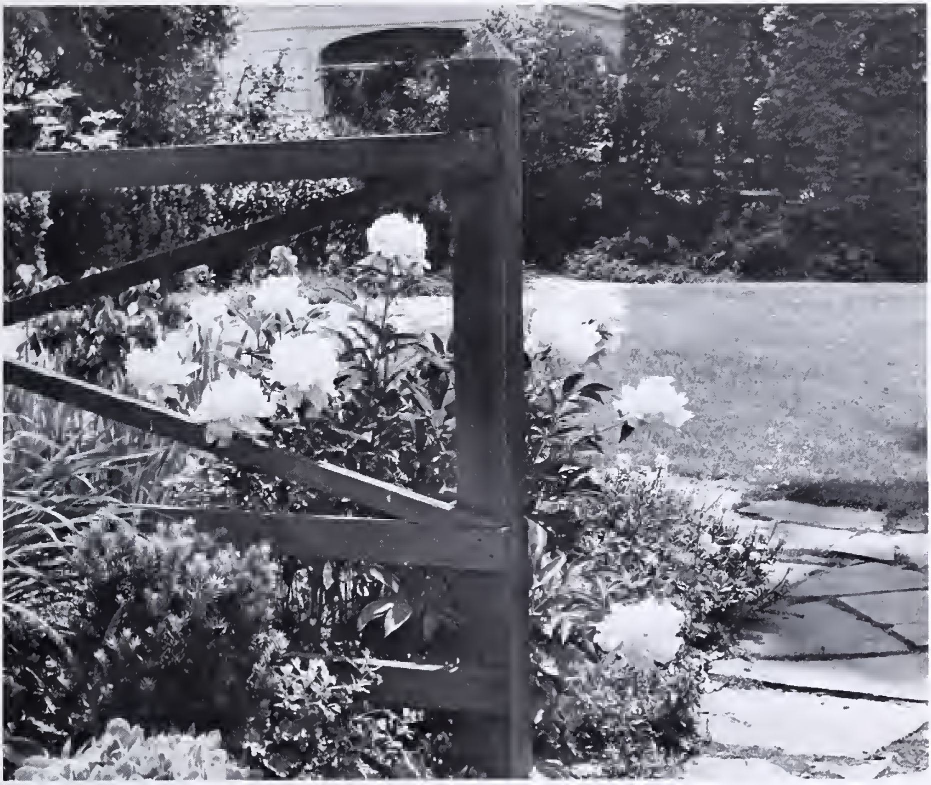
A first step toward creating pleasing effects with plants on small properties is planning. It is wasteful of time, energy and money to follow a hit-or-miss system. Choosing the right plant for the right place prevents problems later.

It pays to make at least a rough plan of sites you want to develop, setting down kinds and quantities of plants needed to do the job. In this way, unsuited items can be eliminated in the beginning.

With imagination a small area which has been left idle may be converted into a thing of beauty. Unlikely spots, such as narrow strips of land along the foundation, shady places under trees, space around the patio, land behind the garage, and corners next to boundary hedges all have high potential for beautification. Here are prime places to establish ferns and wildflowers, neat beds of spring and summer flowers, clusters of plants in containers, a tiny herb or kitchen garden, or an elegant flowering tree.

Elegance and restraint in choice and arrangement of broad-leaved evergreens (gold-dust *Aucuba* and dwarf rhododendron).

Amy Duevell



Molly Adams

Large flowers such as peonies can emphasize an area and lead the eye inward into the rest of the garden.

There is no excuse in small landscapes for nondescript plants. Either a plant shapes up as to its form, style, quality of leaf, bloom or fruit, or it has no place in the scheme of things. Plants not only should have character but also the bred-in quality of restrained size. Nothing is more frustrating than to plant a fast-growing pine, hemlock or dogwood next to the front door where there is space only for a 6-foot specimen.

There are times when it pays to rip out old oversize plants and begin over. No amount of pruning, weeding, spraying will rejuvenate a gnarled old tree or shrub, a flower border gone to grass, or ornamentals dying from borers or scale insects. It's not a defeat, it's a beginning.

It takes some imagination to conceive artistic groupings of plants. This sense of togetherness requires careful observation of plants in all seasons. What follows spring bulbs to cover the bare places? Are there enough evergreens and woody plants having strong trunk and branch structure to present a beautiful vista from the house when the foliage of deciduous plants is gone in winter?

There is the matter of leaf texture—lacy leaves massed in front of heavy foliage. And color value—what it takes in the way of number of plants such as crocus and petunias to create color impact in a given situation.

One final consideration is scale. There is no place for oversize plants in little gardens. Proper plant selection is in fact one of the vital keys to total success. All these factors have been brought into focus in the articles that follow. ⁂

How sweet it is . . .

A CITY GARDEN

Edmond O. Moulin and Frederick McGourty, Jr.

Are you planning a small garden in the city? Don't be discouraged if smug friends in the country tell you that nothing will grow because of the air pollution, the archeological rubble and junk left in the now-compacted soil by forgotten generations of earth-movers, the tomcats staking out territory on your marigold seedlings, and a host of other horror tales. In fact, some of America's best gardens are in cities, and the pleasure you derive from your own backyard sanctuary may be sweeter than that of your friends in the outer reaches, particularly if you happen to bring them some vine-ripened tomatoes on a country weekend while theirs are still green.

Down to Earth

Good gardens, whether in the city or country, are no accident. They are the result of careful planning and diligent work. Although every inch must be made to count in a city garden and the initial preparation of the soil will likely require extra attention, the follow-up maintenance is relatively low. Don't ignore the latter, though, for weeds and badly tended plants have a way of standing out more boldly in small gardens than in large ones. Also, continual watering is a fact of life in long hot urban summers, especially if a number of plants in containers adorn the area.

Even the most wretchedly compacted soil, which is the usual case in cities, can be improved with organic matter such as compost or peat moss, which is available in any garden center and is convenient for city dwellers to use. Ideally, this should be thoroughly mixed into the soil a season ahead of planting. A six-inch-high layer of it, dug into the soil to the depth of a spade blade, is not too much for most situations. Similarly, if the soil is sandy instead of heavy clay, the incorporation of peat moss has the same effect—the improvement of structure. The most important fertilizer to add at this time is superphosphate, which contains phosphorus, an element that affects flowering and root growth. It must be deeply dug in to work best.

East of the Mississippi and especially in cities, the soil pH is strongly acid, for even the rainwater is acid, and most soils require the incorporation of lime for good plant growth. Dolomitic limestone, which also has magnesium, is preferred. A soil test is a sound precaution before doing any liming. Most extension services of state universities conduct this test at a nominal cost. (See *BBG Handbook on Soils* for addresses of the particular agencies and instructions on submitting a sample.) If you request it, the test will indicate what is deficient in the soil and give the rate of amendments needed to correct imbalances for the plants being grown, whether they are vegetables, perennials or particular trees and shrubs.

City soils are frequently poorly drained, and it is a good idea to find out if there are drainage problems before digging a garden, since the majority of plants cannot tolerate continually wet feet. Sometimes the only recourse is to have drainage tiles installed, which is costly and essentially a job for professionals. More often, the problem can be circumvented by elevating the borders 8 or 10 inches with additional soil, sand and peat moss. A brick edging or miniature retaining wall of stones can help prevent wash and aid drainage.

Shade and Roots

City gardens are apt to be shaded by buildings or large trees. This is no real cause for dismay but it does narrow the range of plants you will be able to grow well. Some of them, including rhododendrons, pieris and many other broadleaved evergreens, and annuals such as impatiens, wax begonias and coleus, perform very well in the shade. Shade-tolerant perennials include hostas, astilbes, liriope and well known ground covers such as

Plant Specialists/NYC

An area of peace and relaxation, simply landscaped and decorated. Seedless honey locusts in wells have delicate texture and impose virtually no cleanup problem in autumn.

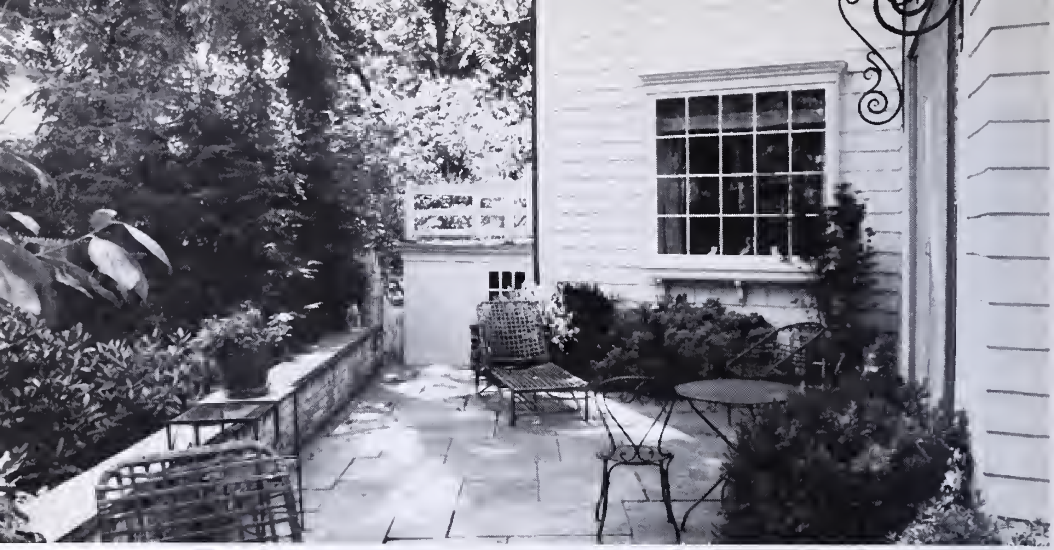
ajuga and periwinkle.

Perhaps a more limiting factor is the competition from large trees, since their roots extend at least as far from the center as do the branches. Surface-rooted old maples are a particular problem and the only plants that can grow well under them for any length of time, after the soil has of course been duly improved, are rugged ground covers such as pachysandra, epimedium and hosta. Expect to water and fertilize these plants more than other ones in the garden. Sometimes a more practical course is to place an attractive mulch around the base of a large tree and put a few containers of the most shade-tolerant plants nearby.

The smaller but actively growing roots near the dripline of a tree pose another dilemma. Of course they may be partly curtailed in the digging of a border, but this is of dubious benefit for the tree and, in any event, roots have a disconcerting way of growing back rather quickly. If such a border is devoted to annuals, the soil should be turned over every year or two and the new roots severed. In the case of perennials, the choice should go to dependable performers such as daylilies and hostas which can stand root competition. There are many fine varieties of each, enough to supply hundreds of small gardens without duplication.

Air Pollutants and Insects

Air pollutants, particularly ozone and sulfur dioxide, have received special attention in recent years, and it must be said that most plants do indeed grow better in clean air. However, in our experience there are relatively few kinds of plants that do not seem to perform satisfactorily in cities with proper culture, the common lilac (*Syringa vulgaris*), summer phlox (*P. paniculata*) and some of the needle evergreens (especially white pine) being among them. Broad-leaved evergreens, presumably in part because of the waxy layer on the leaf surfaces of many kinds, are generally trustworthy performers, and some of the best pieris we have ever seen are in the congested Wall Street



M. Joyner

Above and right are two sides of a home on a very narrow lot. A sense of spaciousness is created by the flagstones, wall and evergreen plantings between the wall and the fence (the true property line).

area of Lower Manhattan. The same might be said of Japanese and English hollies (*Ilex crenata, I. aquifolium*).

The huge amounts of soot particles that fall on a city on a murky, overcast day do no good for plants, much less people. However, the city gardener can do much to protect his plants by a regular misting program in the garden. Set your alarm clock 15 minutes earlier in the morning, get out the hose and attach a fine-spray nozzle. Such cleansing of the foliage does wonders for plants and sometimes for people, too. It is often the best time of day in the garden, and if you have a busy schedule planned at the office this may be your only time for thought and solitude.

Chronically late sleepers may question the timing of this pleasurable task, but there is a sound horticultural reason for it. If plants are watered in the evening, they will remain wet all night, which may induce fungal and other diseases. If they are watered in the morning, the sun will quickly dry the foliage and lessen the chance for infection.

Insect pests are usually a bigger problem than air pollutants in city gardens. On occasion, city gardens are relatively pest-free compared with country ones because of an insular effect (*i.e.*, there are few other gardens in the area to transmit insects), but don't count on it. Certain plants seem to have more than their share of trouble, and if you don't have time to care for them properly, it would be better not to grow them.

Fruit trees are high on this list because they require seven or eight sprayings a season for a blemish-free crop. Euonymus is often subject to scale insects, as are flowering cherries. Borers of different sorts attack flowering peaches, mountain-ash and birches. Verticillium wilt, actually a soil-borne fungus, affects over 300 kinds of plants, including maples. Mimosa wilt, a fusarium, has killed many mimosa- or silk-trees (*Albizia julibrissin*).

The list is a long one and it is wise to learn what a plant may be up against before buying it. In a heavily populated urban area you do not want to use pesticides more than is absolutely necessary, so it is only common sense to avoid the Typhoid Marys of the plant world, and by the same token not to jump for the spray can every time an aphid alights on an ornamental crab.

Designing for Space

How does one make a garden look larger? Apart from the optical illusion caused by widening a path as it progresses from the viewer, there are several techniques. One that was favored in

M. Joyner

The north side of the house has shade-loving ivies and an espaliered yew. See page 39 for garden and pool.

flower-show exhibits for years had to do with partly obscured mirrors. Another method is to place bold-leaved plants in the foreground and ones with refined foliage in the rear. A sounder approach is probably the avoidance of garden clutter—too many plants, too many containers, too much bric-a-brac. Keeping a central area open, perhaps reserved only for a pebble mulch, can give a sense of space (and not make you trip over the barbecue grill).

Also the use of vertical space, as against a wall, can be a big help in increasing garden size. Such a vertical garden might include the traditional hanging baskets and macramé for hanging pots but in addition, fairly new on the market, the utilitarian half baskets which lend themselves beautifully to such spaces. You can literally have a wall of color by the use of selected annuals in them. If a green background is desired, a small-leaved form of Boston-ivy (*Parthenocissus tricuspidata*) is a delicately appropriate vine that takes city conditions beautifully.

Vines are frequently overlooked in city gardens but there seems to be one for about every use—trailing, climbing or cascading over a container. Even ones that can become rampant when planted in the ground, such as the attractive five-leaved akebia and Japanese honeysuckle, which has a delicious floral fragrance, have a place in containers. Moonflower (*Ipomoea alba,* formerly *Calonyction*), an annual vine with large white flowers that open in the evening when you are home to enjoy them, is delightfully scented.

Espaliers, though they require continued pruning to look their formal best, have a role in vertical gardens, especially against a white stucco or brick wall. Among the most commonly used shrubs for the purpose are firethorns (*Pyracantha* cultivars), spreading cotoneaster (*C. divaricatus*) and yews, but several multi-stemmed trees are appropriate for an informal espalier. One of the best is sweet-bay (*Magnolia virginiana*), which has highly scented flowers in late spring and possesses more refined foliage than the evergreen southern magnolia (*M. grandiflora*), a tree not usually grown north of Baltimore because of its tenderness.

A point to remember is that city gardens are milder in winter than rural ones in the same latitude because buildings modify the climate, so it is often possible to grow a plant north of its customary hardiness limits, especially if it has its back against the wall—literally. For example, *Photinia x fraseri,* a slightly tender large evergreen shrub with reddish new foliage through much of the growing season, can be wintered over safely in New York and similar climes, and its best use in the North is probably as an informal espalier.

Mulches and Tools

Mulches have a special importance in city gardens. Not only do they retain moisture in the soil and cut down on weeds, they can be attractive in their own right. A wide variety, including cocoa bean hulls, buckwheat hulls, sugar cane and pine bark chips (in different sizes), is available. There are also stone chips in a range of colors, and these may have a prime use beneath trees or in other trouble spots. A Japanese feeling can sometimes be imparted by the use of them, and a visit to the Brooklyn Botanic Garden's replica of the Ryoanji Garden, which consists entirely of stones, may spark ideas for many city dwellers.

What are the essential tools for a city garden? After the initial planting has been done, pruning shears, a trowel, a hand cultivator and a hose, plus an adapter for the kitchen sink if there is no outdoor faucet, are probably the most important. A mister nozzle for the hose is also a good idea. Keep tools as simple and as few as possible, and don't carry a full armory of supplies. It is better to buy small amounts and use them up quickly, even though the unit cost may be higher. You don't want to stumble over a bale of peat moss at 3 AM during a somnabulistic stroll through the house or garden.

Make It Personal

Finally, remember that a garden, especially a city one, is a sanctuary, a private reserve that reflects your own tastes in a very personal way. Consider the time of day when your garden is most important to you. Is it in the evening that you use it most? Then why not choose plants with white or pale yellow flowers, which show up best at night? Where do you sit the most in a garden? Should this not be the place from which plants can best be seen? Do you need cheering up at the end of the day? Perhaps brightly colored annuals will help. Do you need peace and quiet? Maybe tranquil evergreens are best. Ask yourself questions such as these before lifting a shovel and you will be on your way to having a garden that will be part of your life. ✿

Birches in tubs, hanging baskets and plants trained up the trellis create a vertical environment in a minimum of space.

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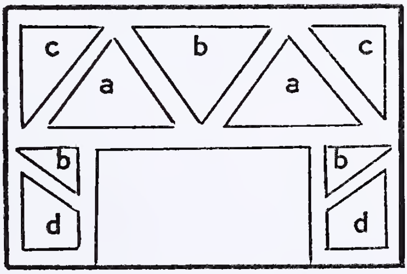
BLUEPRINTS FOR CITY GARDENS

Each year in the ornamental demonstration gardens of Rutgers University a series of plots are planted to illustrate the use of common garden flowers, herbs and vegetables in small garden designs. There has been considerable interest in these little gardens, particularly where vegetables and flowers, or flowers and herbs have been combined. The main requirements for selecting plants for these gardens are a neat growth habit and long season of bloom or, in the case of vegetables, production. Gardens are open to the public and are a feature of their Annual Field Day held in summer. This project is typical of the services offered by many state colleges, experiment stations and botanical gardens for public education in planning and planting small gardens.

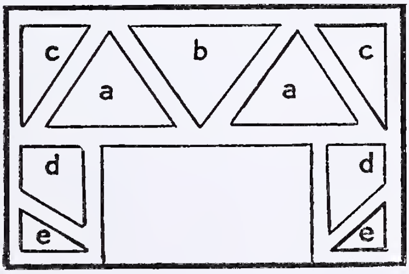
SUN
Bed 14B:
DIANTHUS, 'Magic Charm', pink (c)
'Magic Charm', white (b)
NIEREMBERGIA, 'Regal Robe',
blue-purple (a)
ZINNIA, 'Mini Pink' (d)

Bed 14B



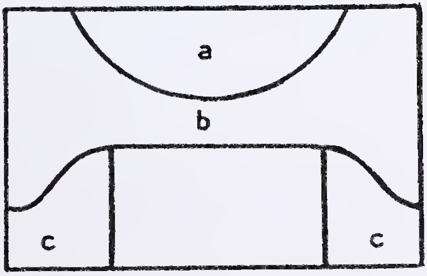
SUN
Bed 17B:
BASIL, 'Compact Green' (b)
'Dark Opal' (c)
CHIVES, *Allium* (e)
SAGE, *Salvia officinalis*, blue (a)
OREGANO (d)

Bed 17B



SHADE
Bed 18J:
BEGONIA, 'Drapeau Scarlet' (a)
'Viva', white (b)
NIEREMBERGIA, 'Purple Robe' (c)

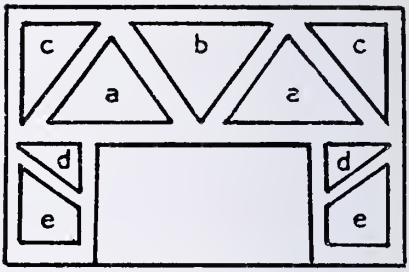
Bed 18J



All illustrations: Cook College, Rutgers, The State University

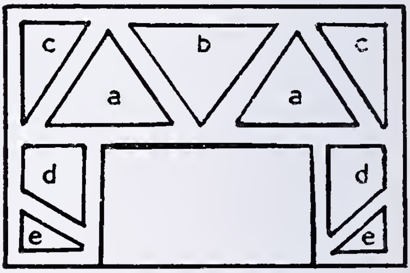
SUN
Bed 14B:
SNAPDRAGON, 'Carioca Yellow' (a)
PEPPER, 'Staddon's Select' (b)
TOMATO, 'Patio' (c)
RHUBARB CHARD, deep red (d)
BEAN, 'Goldcrop' (e)

Bed 14B



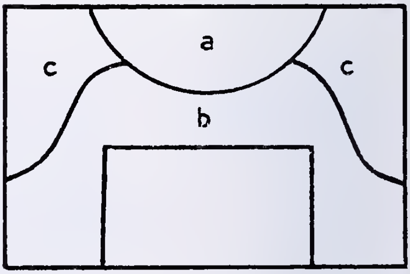
SUN
Bed 17B:
ROSE GERANIUM (a)
SAGE (b)
BASIL, 'Compact Green' (c)
OREGANO (d)
CHIVES, *Allium* (e)

Bed 17B



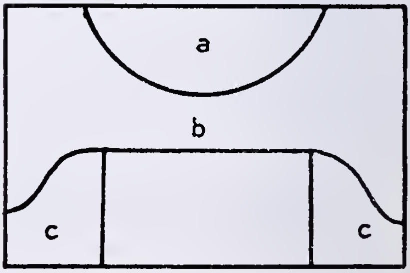
SHADE
Bed 18J:
BEGONIA, 'Scarletta' (a)
VINCA, 'Little Blanche', white (b)
NIEREMBERGIA, 'Purple Robe' (c)

Bed 18J



SHADE
Bed 19J:
IMPATIENS, 'Elfin Rose' (c)
'Elfin White' (b)
'Tangerine' (a)

Bed 19J



A prominent nurseryman suggests . . .

TREES FOR THE SMALL GARDEN

William Flemer, III

Since the end of World War II there have been two noticeable and consistent trends in gardening. Home gardens have in general become smaller, and their design and components have become simpler. There are of course always exceptions, but the smaller garden is here to stay. There is just not the labor available to maintain big plantings, and land costs are perennially creeping upward. Furthermore there is now more interest in gardening among the younger city dwellers, and lovely little gardens are being tucked into spaces which were formerly ignored.

The result of this trend toward smallness is that there is little place for the traditional shade trees which can become forest giants. The big elms, oaks, maples and sycamores are simply too large for the small garden, and when they approach mature size nothing else can compete successfully with them. Fortunately there are a great many kinds of trees which are of very limited stature even when mature, including some which are quite in scale with a tiny roof garden. Even where there is space for one really big tree, more and more gardeners are planting several smaller specimens instead. This diversity permits the homeowner to enjoy different colors of flowers, different seasons of bloom, different autumn leaf colors and bark textures, and often a variety of colorful fruits.

The following list of trees is composed of species or cultivated varieties which are small (30 feet tall or less at maturity) and highly desirable for planting whereever space is limited. Not many large trees have showy flowers, but among the smaller kinds can be found some of the most spectacular flowering trees which are hardy in temperate climates. Most are included because they have more than one season of interest. For example, they may have beautiful spring flowers and showy autumn color or interesting bark which is attractive in winter. Some are unusually tolerant of city conditions and this is noted in their descriptions.

Choice Kinds

Japanese maple *(Acer palmatum).* Although red-leaved Japanese maples are the most commonly planted, the wild green-leaf forms and their variants are more suitable for gardens where space is very limited. They are often notable for the fantastic color changes which the leaves undergo during the growing season. Frequently coral or bright red at first, they become a restful green during the summer months, only to turn brilliant yellow, scarlet or crimson in autumn. The foliage is delicate and lacy, and the trees become 20 feet tall and as broad at maturity. They are hardy in Zone 5 (Arnold Arboretum map, inside back cover).

Red buckeye *(Aesculus pavia splendens).* This is a striking little native tree of the South, bearing multitudes of upright panicles of bright red flowers in mid-May. The boldly handsome foliage is a lustrous dark green compound with 5 leaflets, and immune to the leaf-scorch disease which disfigures most of its horsechestnut kin. It can be grown in single stem or clump form, reaching 30 feet in height and being hardy in Zone 5. Unlike its larger relatives, it blooms quite early in life, so the home gardener need not wait very long for the first display of flowers.

Shadblow, serviceberry *(Amelanchier canadensis)* and closely related species. These are among our loveliest small native trees, with something to offer throughout the year. In early spring they

Photo: S. Ries, Courtesy of Princeton Nurseries

Pagoda tree (*Sophora japonica*) and golden-rain tree (*Koelreuteria paniculata*) were chosen for this memorial garden in New York City because they both have prolonged blooming periods in summer.

are covered with clouds of fleecy white flowers. In autumn the leaves turn attractive shades of orange and red, and in winter the pale gray bark is very decorative. Like so many trees with handsome bark, the stem display is greatly improved by planting clump or multi-stemmed specimens. Shadblows, hardy in Zone 4, are well adapted to seashore planting.

Japanese dogwood *(Cornus kousa)*. Many tree experts feel this species is at least the equal of the eastern flowering dogwood (*C. florida*) in beauty; it is superior in utility because it gets neither the borer insects nor the twig gall disease which can attack the latter. Japanese dogwood blooms in June, a month after our native species, and the spectacular white bracts or "petals" are pointed rather than notched. Autumn leaf color is a showy blend of red and scarlet and the rosy red fruits are very decorative in late summer. An exciting new patented cultivar is called 'Summer Stars'. Its flower bracts last an exceptionally long time and provide a lovely display throughout July and even longer along the eastern coast. It is hardy in Zone 5.

'Crimson Cloud' hawthorn (patented cultivar of *Crataegus laevigata*, which gardeners know as *C. oxyacantha*). Like most hawthorns, 'Crimson Cloud' grows exceptionally well in city conditions. Unlike any others, it has showy bright crimson flowers, each with a white star in the center to give sparkle. It bears long-lasting red fruits in autumn and, best of all, the leathery, dark green foliage is immune to the fungus which defoliates other English hawthorns in summer. It is hardy in Zone 4 and reaches 30 feet in height.

Crape-myrtle *(Lagerstroemia indica)*. From Zone 7 south, this is the king of our summer flowering trees and taller shrubs. The flowers are big handsome trusses borne in July and August in shades of white, pink, red, bluish or purple, depending upon the variety. The bark is especially colorful, flaking off to reveal patches of lighter shades, creating a mottled effect. The lower growing but very floriferous cultivar 'William Toovey' is the best for small gardens. It bears spectacular clusters of watermelon-red flowers. Diminutive shrubby varieties also exist. Crape-myrtle grows well in city gardens.

Saucer magnolia *(Magnolia* x *soulangiana)*. Few hardy trees can create the remarkable "tropical" effect of a pink saucer magnolia in full bloom in May. Oddly enough, this exotic-looking tree also grows exceptionally well in the city garden. It has beautiful gray bark which is attractive in winter. Saucer magnolia makes a fine espalier against a wall. In wet, humid summers some forms of it bloom recurrently during summer so the marvelous spring show is not the only floral display. It is hardy in Zone 5, or further north when grown on a south wall.

'American Beauty' crab apple *(Malus* cultivar). This is the first double red-flowered crab apple cultivar which is a consistent and heavy bloomer. Because the blossoms lack the normal complement of stamens and pistils, it is semi-sterile and does not bear the heavy crops of fruits which cause most single-flowered crabs to be alternate bloomers. 'American Beauty' is upright in growth habit, 30 feet tall at maturity, and is hardy in Zone 4. The flowers are a much deeper and more intense red than 'Hopa', 'Almey' or the other older red varieties.

Sorrel-tree, sourwood (*Oxydendrum arboreum*) This lovely small tree, a wildling of the South, is a strong contender for the title of our most beautiful native species. It must have acid soil to thrive, but in such naturally acid-soil regions from Zone 4 southward it is unmatched for its many seasons of interest. The leaves are apricot to red when they first open. In mid-July when few other trees are in bloom graceful racemes of fragrant white flowers are borne. Leaves turn a lustrous, brilliant red in autumn and are greatly enhanced and contrasted by the pale yellow seed capsules. Sorrel-tree is a perfect companion for azaleas and rhododendrons as it thrives in exactly the same soil conditions in which they grow best.

Paul Frese

In the small home garden a tree, such as this flowering crab, lends texture and color when space is at a premium.

Mount Fuji cherry (*Prunus serrulata* 'Shirotae'). The hardiest and most popular of the double Japanese cherries is the upright growing, deep pink-flowered 'Kwanzan'. However it does make a big tree in time, and for the very small garden the Mount Fuji cherry is a much more dwarf and charming kind to use. It is hardy in Zone 6, grows about 12 feet tall and perhaps 15 feet in width. Its great charm is in the lovely clusters of fringed flowers, borne with lavish abundance in May. These are a delicate pink in bud and gradually fade to a pure white. Being double, and opening later in more settled weather, the flowers last much longer than the early single-flowered Japanese cherries.

Korean stewartia (*Stewartia koreana*). The little-known but beautiful stewartia genus contains some of the choicest trees for the small garden, but they are virtually unknown to the gardening public. Some are unfortunately none too hardy, and none like very dry locations. Korean stewartia is the hardiest of the various species (Zone 5) and also fortunately has the showiest flowers. They resemble single camellias and are white with golden centers, 3 inches in diameter, and open successively for a long period in July. The tree makes a fine, rather pyramidal specimen up to 30 feet in height, with colorful mottled bark. Autumn color is a striking orange-red. (*Ed. note*—Some botanists now consider Korean stewartia to be a cultivar of *S. pseudocamellia*.)

Japanese snowbell (*Styrax japonica*). This neat, dense little tree, with its clean foliage and pretty horizontal branches, is especially nice to plant overhanging a patio or terrace. This is because the pendant flowers, which look like white fuchsia blooms, are most effective when viewed from below—as from a restful garden chair. They are borne in great abundance in early June so that the whole tree appears white during the blooming period. Japanese snowbell is hardy in Zone 5, tolerates shade, and rarely exceeds 15 feet in height—just right for the small garden.

The short list given above by no means includes all of the trees worthy of planting in the small garden. It does include many of the best ones however, and it is a good place to start when beginning that delightful task of choosing the "right" trees for the limited space available. ⁂

Columnar Trees

Narrow-growing trees with branches arching skyward have an occasional role in small gardens. Usually rather formal but a desirable change of pace from undulating undercover shrubs, these sentries must be used with restraint unless the garden is to resemble a comic-strip series of exclamation points. Many begin to lose their character after 10 or 15 years as the weight of the limbs increases and branches bend. By and large, these are not trees for posterity, nor perhaps in a small garden should they be.

For spring bloom two of the most pleasing are the columnar pink Japanese cherry (*Prunus serrulata* 'Amanogawa') and the columnar single-seed hawthorn (*Crataegus monogyna* 'Stricta'), which has white flowers. For winter bark character the narrow European birch (*Betula pendula* 'Fastigiata') is appropriate in parts of the country where borers are not a major problem; also the relatively slow-growing columnar beech (*Fagus sylvatica* 'Fastigiata'), which, after many years, will outgrow the small garden.

For evergreen foliage there are many narrow-growing variants of *Juniperus chinensis* and *J. virginiana* (see BBG Handbook #83 for thumbnail descriptions). In very mild climates the columnar Italian cypress (*Cupressus sempervirens* 'Stricta') is a common choice. ⁂

Best Fruits For Small Places

In a garden hedged in by essential small trees and shrubs, it is hard to find a place for fruits. Yet there is always the temptation to try dwarf apples, pears, peaches, cherries and plums. In terms of a quick return—maybe the second year after planting—peaches are the best bet. There are dwarf forms of such standard peach varieties as 'Golden Jubilee', 'Elberta' and 'Red Haven'.

Since it is common practice to stimulate new fruit-bearing wood by pruning peaches much harder than other fruits, the trees can be kept down to dwarf size—about 8 feet in height.

Other fruits that can be used as landscape subjects are currants and blueberries. Blueberries in particular have much ornamental value when their foliage turns red in fall. Only when covered with black netting to ward off the birds are they less presentable.

No one can say how many strawberry pyramid kits have been sold and how few are still in use after the second year. The same goes for strawberry barrels. Both are sold as the perfect answer to raising strawberries in little gardens. If tempted, just be aware that they require constant attention to feeding, watering, and winter protection. If strawberries are desired in the small garden an edging of Baron Solemacher strawberry along a path or vegetable plot has a better chance of bearing satisfactory amounts of fruit. Once plants started from seed mature, they will produce small sweet fruit all season long.

Where a lush, large-leaf vine fits the landscape theme, consider planting a grape. Even beyond the bonus of a harvest of fruit, a grapevine quickly covers a lattice, arbor, or wall with elegant foliage. ❧

Grapes trained on a kitchen window trellis almost bring the garden right into the house. An added bonus is the aroma when the sun strikes the ripening clusters.

Paul Frese

Some of the best . . .

EVERGREENS FOR LITTLE GARDENS

Quentin C. Schlieder, Jr.

Evergreens are an essential ingredient in developing an effective landscape, even of Lilliputian scale. A very wide range of low-growing kinds with varied leaf colors and textures, as well as different growth habits, can be grown in the milder parts of the United States. However, even in the North there is no shortage of appropriate dwarfs for use in small gardens, where space must be closely measured.

Evergreens provide a feeling of permanence and continuity in a garden, particularly if it is remembered that deciduous plants in many parts of the country are leafless five or six months of the year. Although the latter plants are also critical ingredients of the well-designed garden, many people are learning that evergreens can provide a pleasing main structure.

Meaning of Evergreen

The term evergreen is often misunderstood, since even these plants lose foliage, though not all at one time. Some varieties of American holly, for example, shed as many as two-thirds of their leaves each spring as a normal course of growth. Pines drop great quantities of older needles in autumn, and this phenomenon should not unduly concern the new gardener. Further, not all evergreens have green foliage. Some Colorado spruces and junipers have a cool metallic luster, and certain false-cypresses are a rich gold. There are also seasonal changes, especially among junipers and cryptomerias, both of which may be almost plum-colored in winter.

There are needle evergreens and broad-leaved evergreens. The former are conifers (literally, cone-bearers) or close relatives of them, although not quite all conifers are evergreen. Broad-leaved evergreens belong to a number of different plant families and often have conspicuous flowers. Even here the distinction may be a source of confusion because many heaths *(Erica)*, which are broad-leaved evergreens grown in part for their attractive small bell-shaped blossoms, have needlelike leaves, and the novice can easily mistake them for dwarf conifers.

Landscape Considerations

Dwarf and slow-growing evergreens are enjoying increased popularity in foundation plantings, borders, containers and rock gardens. Since their stature is a result of genetics, rather than inducement by chemicals or pruning shears, they are relatively low maintenance plants. In many situations the original investment in these plants may be initially greater. However, because they require less pruning and do not outgrow their locations quickly, they are a better value in the long term.

The new grower should exercise restraint during his first nursery visit. The compulsion to have "one of this" and "one of that" results in an assemblage of plants, not a garden. As in baking a cake, the effective landscape is brought about by the proper combination of plants in their proper proportions. Scale is a frequently neglected element when using dwarf evergreens. A gardener should learn about the growth habits and eventual size of the plants to avoid underplanting or, far more common, overplanting an area. Unity is another element which too often is ignored. Repetition of similar colors and textures preserves harmony. However, caution again is advised, as too much unity can be monotonous. Like the recipe for the cake, the proportions are critical.

Consider the cultural requirements of the plants, too. Even the most spectacular specimen will grow unsightly if its needs are ignored. It is better to select the plant to fit the conditions than to modify the conditions to suit the plant. For example, to grow a dwarf Colorado spruce or other conifer in the shade (ex-

Paul Frese

An illusion of greater space is created when the eye is led up and back by careful placement of dwarf evergreens among the rocks which have been laid out to simulate natural placement.

cept hemlocks and some of the false-cypresses), is futile because these plants must have good light to perform well. Likewise, to plant most kinds of broad-leaved evergreens, including boxwood, in poorly drained soil will result in disappointment. In colder parts of the country many broad-leaved evergreens will suffer leaf injury if they don't receive some winter shade, such as that provided by a northern exposure. In short, get to know the plant and its requirements.

The following list of personal favorites is but a brief example of the many fine low-growing broad-leaved evergreens available today. Some of them are dependable old standbys, others are promising newcomers that may require a bit of a search to find locally. Numbers in parentheses after a plant name indicate hardiness zones (Arnold Arboretum map, inside back cover). An asterisk (*) denotes members of the Heath Family (Ericaceae), which require acid soil to perform well.

Selected Evergreens

Bearberry *(Arctostaphylos uva-ursi)* (2)*—This prostrate shiny-leaved ground cover is native to Europe, North America and Northern Asia. It displays attractive white bell-shaped flowers in May, followed by scarlet berries in autumn. It prefers sandy soil and is tolerant of both sun and shade.

Warty barberry *(Berberis verruculosa)* (5)—A beautiful mound-shaped shrub with shiny, deep green foliage which turns rich burgundy in winter. A bonus is the fragrant yellow flowers, appearing in profusion each spring. This spiny plant, a native of China, is tolerant of sun and shade and a wide variety of soils. Useful in foundation plantings and as a dwarf hedge.

Kingsville Dwarf boxwood *(Buxus microphylla* 'Compacta') (5)—A slow grower, eventually forming a tight, compact, deep lustrous green shrub. Like other boxwoods, it performs best in a slightly alkaline soil which is well drained. Tolerant of both sun and shade, it makes a superb specimen for bonsai or in the rock garden. The parent plant, now more than 35 years old, is 12 inches high and 4 feet in diameter.

Heather (*Calluna vulgaris,* in variety) (4)*—Heather forms dense mats of twiggy growth with fine needlelike foliage in shades of green, gray or gold, depending on the variety. Flower color may be white, pink, purple or deep rose. Blossoms are borne on upright spikelike racemes that range from 1 to 6 inches in height. A good plant for beds, borders and rock gardens.

Dwarf Hinoki false-cypress (*Chamaecyparis obtusa* 'Nana') (3)—A very choice Japanese plant for containers, bonsai and rock gardens. It grows as a miniature flat-topped dome with cupped upward-facing "fans" of deep green foliage. In ten years it will not exceed one foot in any dimension.

Pyramidal dwarf Hinoki false-cypress (*Chamaecyparis obtusa* 'Nana Gracilis') A fine plant for borders and foundation plantings, attaining a height of three feet and a width of 15 inches in ten years. Foliage similar to the preceding. Ultimately, this selection grows into a broad pyramid. Like the previous plant, it grows well in rich soil in sun or shade.

Dwarf golden threadleaf false-cypress (*Chamaecyparis pisifera* 'Golden Mop') (3)—A diminutive version of the golden thread-leaf false-cypress which can reach tree-like dimensions at maturity. The dwarf form is a dense-growing dome-shaped shrub which displays its color best in full sun. This selection is useful in foundation plantings, borders and rock gardens. Attains a height of 3 feet.

Dwarf rockspray (*Cotoneaster microphyllus* 'Cochleatus') (5)—A prostrate shrub with shiny, deep green leaves. It is adorned with solitary white flowers in spring, followed by round scarlet fruits which are about a quarter of an inch in size. This selection is useful as a ground cover or rock garden plant and can also be grown as a handsome container plant. Requires well-drained soil but adapts to sun or shade.

Garland flower (*Daphne cneorum*) (5)—Garland flower is a handsome addition to borders and rock gardens although, like most daphnes, it can be temperamental in cultivation. This native of Southern Europe has fragrant rosy-pink flowers in terminal clusters. It eventually forms a compact mound 6 to 12 inches high. Needs a well-drained organic soil in sun or shade.

Heath (*Erica*, in variety)*—There is a certain sentimentality and history which seems a part of this famous relative of the rhododendron. It requires an acid peaty soil in full sun or part shade. White to deep rose blooms appear in racemes from January through May. The deep green, needlelike foliage turns bronze in winter. Hardiness varies from species to species, although many can survive temperatures to −10 F. Heath is an excellent plant for borders and the rock garden.

Box huckleberry (*Gaylussacia brachycera*) (5)*—An uncommon native subshrub found in isolated colonies in the Appalachian Mountains. It is believed to be among the world's oldest living plants. One Pennsylvania colony may be 13,000 years old. The plant forms a sparse creeping mat in its native woodlands, but in full sun in the garden grows into a handsome dense ground cover about 1 foot high. The lustrous deep green leaves turn a rich burgundy in winter and are spectacular against the winter snowscape. The delicate bell-shaped flowers followed by tasty blue huckleberries are bonuses. Box huckleberry requires an acid peaty soil which is well drained.

Heller Japanese holly (*Ilex crenata* 'Helleri') (5)—There are many fine selections of Japanese holly but few are as functional and attractive as this one which originated in this country in 1936. This tight-growing mound-shaped shrub has small, deep green, non-spiny leaves on stems arranged in horizontal planes. Superb for the rock garden, hedges, borders, foundation plantings and containers. In a container the plant develops a weeping habit which is very handsome. Grows well in sun or shade and in a wide variety of soils, although good drainage is essential. A 26-year-old specimen grew to 4 feet in height and 5 feet in width.

Compact inkberry (*Ilex glabra* 'Compacta') (3)—This globe-shaped plant, somewhat looser in growth habit than Heller holly and with larger leaves, will eventually grow to 3 or 4 feet in height. It has lustrous, elliptic, deep green leaves, which are not spiny. The berries, borne from autumn to winter, are black. A very versatile plant because it is tolerant of both wet and dry soils.

Maryland Dwarf American holly (*Ilex opaca* 'Maryland Dwarf') (6)—Instead of having the pyramidal habit of most American hollies, this selection grows into a neat spreading mound 4 or 5 feet wide and 1 to 2 feet tall. It makes a superb ground cover and is a useful transitional plant in a foundation grouping. It rarely fruits but its unique and lovely habit and interesting texture are compensations. The foliage is dark leathery green and spiny. Maryland Dwarf will grow in either full sun or deep shade and prefers a well drained soil. Only pest—leaf miner.

Dwarf mountain-laurel (*Kalmia latifolia myrtifolia*) (5)*—A diminutive version of a much-loved native shrub. Flowers, leaves and internodes are one-third the size of the typical mountain-laurel. The plant rarely exceeds three feet in height and is choice in rock gardens, borders and foundation plantings. It grows well in evenly moist soil in part shade.

Box sand-myrtle (*Leiophyllum buxifolium*) (5)*—A charming plant with small, lustrous green foliage which turns bronze in winter. The flower buds are pink and the open flowers are pure white, producing a beautiful and unusual effect. There are several named selections. Mature plants are generally about 18 inches high and grow well in moist peaty soil in full sun. Very effective in groups.

Dwarf drooping leucothoe (*Leucothoe fontanesiana* 'Nana') (4)*—An excellent shrub for foundation plantings and woodland gardens. White bell-shaped flowers are borne in axillary clusters. The foliage tends to turn bronze in winter. A mature plant rarely exceeds 2 feet and spreads 6 feet. It is tolerant of shade and grows best in a rich humus. *Leucothoe keiskei* is also choice but harder to obtain.

Privet honeysuckle (*Lonicera pileata*) (5)—A refined plant with dense horizontal branches and spreading growth habit. The deep, lustrous green leaves are opposite and regularly spaced along the stem, suggesting a small-leaved privet. Useful as a ground cover or as a dwarf hedge. Eventual height is about 12 inches in the North, taller in the South. It grows well in sun or shade and is not particular about soil.

Canby's paxistima (*Paxistima canbyi*) (5)—A handsome compact native shrub which can be employed effectively as a ground cover, a specimen in the rockery, or as a low plant in front of foundation plantings. It requires acid soil but will grow in either full sun or shade. Height rarely exceeds 12 inches. Paxistima resents fertilizers and may be lost if subjected to them.

Gregory Norway spruce (*Picea abies* 'Gregoryana') (5)—This dwarf selection of Norway spruce attains a broad rounded habit at maturity. A fine old planting can be seen at Bayard Cutting Arboretum, Oakdale, Long Island, N.Y. Gregory spruce has a medium green color and is effective as a specimen or in a foundation planting. Full sun and well-drained soil are necessary. It rarely exceeds 3 feet in height but grows many times that in diameter. Also choice is *Picea abies* 'Merkii', which forms a dense irregular pyramid about 3 feet tall and slightly broader. There are many other fine dwarf Norways.

Ground hugging evergreens such as creeping junipers and dwarf pines act as both ground cover and plants of year round color. Their slow growth among the rocks assures low maintenance.

A. E. Bye and Associates

Dwarf Alberta spruce (*Picea glauca* 'Conica') (2)—One of the most popular dwarf conifers, and a first-class rock garden subject. This selection grows into a very dense and regular cone which can reach ten feet at maturity. Because of its dense habit, it is prone to attacks by red spider in dry years. It requires full sun or part shade and good drainage.

Montgomery blue spruce (*Picea pungens* 'Montgomery') (2)—This is a beautiful specimen for the rock garden or foundation planting. The foliage is bright blue-green on this dense, broadly pyramidal shrub. Full sun and good drainage are needed. At maturity the Montgomery spruce attains a height of about 5 feet and a spread of 4 feet.

Millstream mountain-andromeda (*Pieris floribunda* 'Millstream') (4)*—This choice slow-growing form of a handsome American species was selected by noted plantsman H. Lincoln Foster. In April the waxy, white bell-shaped flowers stand almost erect above the lustrous, deep green foliage. It is difficult to locate in the nursery trade because it is difficult to propagate, but the search is well worth the effort. Give this plant and other pieris some shade, especially in winter, and incorporate peat or compost in the soil.

Bisby Dwarf Japanese pieris (*Pieris japonica* 'Bisby Dwarf') (3)*—This is a lovely dwarf globe-shaped plant with very small, deep green leaves. It is excellent in a container and is also effective in the rock garden. This selection is relatively new in the trade and the ultimate height is unknown, but it is indeed diminutive. 'Pygmaea', a cultivar with needlelike foliage, grows slowly to 2-2½ feet, as does 'Variegata', an excellent accent plant. For culture see the preceding entry.

Dwarf Eastern white pine (*Pinus strobus* 'Nana') (3)—Deservedly popular because the medium green foliage has bluish highlights and is so dense as to hide the plant's inner structure. Annual growth is only 2 to 3 inches. This dwarf eventually becomes an irregular globe-shaped shrub 4 to 6 feet in height. It is useful in foundation plantings, rock gardens and bonsai. Tolerant of many soil types and prefers full sun.

Dwarf Scots pine (*Pinus sylvestris* 'Beuvronensis') (2)—A beautiful globe-shaped plant for the rock garden. In 25 years it will not exceed 2 feet in height and 30 inches in width. Dwarf Scots pine should be grown in well-drained soil in full sun. 'Hillside Creeper' is another fine selection. A 10-year-old plant with rich mint-green foliage is about 4 feet in diameter and less than 8 inches high.

Otto Luyken cherry-laurel (*Prunus laurocerasus* 'Otto Luyken') (5)—This broad-leaved evergreen has shiny, pointed, dark green leaves and is an excellent shrub for the rock garden, borders and foundation plantings. The flowers, which appear each May, are borne in showy, spikelike racemes that are held gracefully skyward. They are white with touches of pink and gold. At maturity the plant is less than 3 feet in height. Part shade, particularly in winter, is desirable, as is a good garden loam.

***Rhododendron x* 'Boule de Neige'** (5)*—This handsome hybrid has withstood the test of time. It forms a compact mound, and so beautiful are its growth and foliage that, were it not to bloom at all, it would still be a highly commendable plant. The blossoms are pure white, delicately frilled and appear dependably every spring in large globular trusses. Although it is tolerant of sun, it grows better in part shade with some protection from winter sun and wind. It grows well in an organic, well-drained soil. Boule de Neige is an excellent plant for use throughout the garden.

Rhododendron x myrtifolium (6)*—A handsome compact plant with bluish-green foliage and lilac pink flowers in loose clusters. (Parentage: *Rhododendron hirsutum x minus*.) Lovely in rock gardens. Requires an organic, well-drained soil and part shade to be at its best.

Rhododendron smirnowii (5)*—This rugged rhododendron seldom exceeds four feet in height in northern gardens. It grows into a compact globe with handsome foliage covered on the underside by thick, felt-like hairs (indumentum). Exceptionally hardy, and excellent in foundation plantings and borders. Pink, frilled flowers are borne in large trusses which practically smother the plant. Even the silver flower buds are ornamental for a good period of the year. Seems to be tricky to propagate, perhaps the reason why commercial nurserymen shy away, but it is well worth the premium price commanded. This plant requires a well-drained, organic soil and is tolerant of full sun.

Rhododendron yakusimanum (4?)*—Many selections and hybrids of this species are on the market today and most are worth growing. It forms a compact shrub up to 3 feet in height. The leaves are deep glossy green above, covered by a tan to gray tan indumentum beneath. The new growth as it emerges is completely covered by the indumentum and in some cultivars is as handsome as the flowers. The flowers are borne in exceptionally large trusses. The buds are pink but the open flow-

Whether in bloom or as a back drop later in the season, azaleas are one of the most satisfactory shrubs for small gardens.

George Taloumis

ers quickly fade to white. A wonderful plant for the rock garden.

Chinese sarcococca (*Sarcococca hookeriana humilis*) (5)—A tidy evergreen shrub which rarely grows higher than 2 feet. It makes an excellent ground cover and foundation plant in shady locations. This plant has lance-shaped, glossy green leaves about 2 inches in length and bears fragrant cream-colored flowers in clusters.

Japanese skimmia (*Skimmia japonica*) (7)—This shade-loving plant has fragrant white flowers followed by bright scarlet fruits in terminal clusters which often persist all winter. Under ideal conditions, Japanese skimmia will grow 2 to 4 feet tall and 3 to 6 feet across. It may be grown in a protected site as far north as New York City. Skimmia is an excellent foundation plant on the north side of a building where it will receive shade. Like hollies, there are both male and female plants, and only female plants bear fruit, but a male must also be planted for pollination if fruit is desired. Skimmia grows best in a moist but well-drained organic soil.

Repandent English yew (*Taxus baccata* 'Repandens') (5)—This is one of the most popular evergreens used in landscaping, and its popularity is well deserved. The needles are practically black-green with a depth of color not seen in many plants. Its arching habit is very graceful and makes this plant ideal for many sites. It does require good drainage but will tolerate very deep shade. The height rarely exceeds 1 foot although very old plants are known to achieve a spread of 13 feet.

Bennett Hemlock *(Tsuga canadensis* 'Bennett') (4)—Perhaps the most graceful of the dwarf hemlocks. It reminds one of a spraying fountain because of its arching branches emanating symmetrically from the center of the plant. It is a lovely plant for foundation plantings, borders and the rock garden. In ten years it grows 3 feet high and about 4 feet wide. Bennett hemlock also prefers at least part shade and a moist but well-drained loam.

Cole's prostrate hemlock (*Tsuga canadensis* 'Cole') (4)—This handsome plant literally flows with the contours, almost as if the branches were glued to the ground. A moist but well-drained loam is necessary. It will burn severely if grown in full sun, and winter sun is lethal. It forms a prostrate shrub with exposed top branches which provide a lovely effect. The plant can be staked and as the pendulous branches grow, it is reminiscent of falling water. Cole's prostrate hemlock is useful in the shaded rock garden and when planted in groups is an elegant ground cover on which no foot of man may tred. ⁂

For seasonal interest . . .

DECIDUOUS SHRUBS ENHANCE THE SMALL GARDEN

Gordon E. Jones

The selection of shrubs for landscaping the small garden is often largely limited to the many fine evergreen shrubs now available in nurseries. There are, however, several choice small deciduous shrubs which should not be overlooked. They can add much floral interest to a planting as well as variety in foliage texture and their autumn hues are often brilliant. Some of them also have distinctive bark or branching patterns that are especially noticeable in winter. Here is a selected list of low-growing deciduous shrubs that have proven useful for us at Planting Fields Arboretum, Oyster Bay, Long Island, New York. Most are winter hardy except in the very coldest parts of the United States.

Barberry—*Berberis thunbergii* 'Crimson Pygmy', a form of Japanese barberry, is striking in its brilliant deep red foliage, if grown in full sun, and in its very compact habit of growth. It is extremely serviceable as a colorful low hedge or, planted alone, as a season-long spot of bright color in the foreground among other shrubs. Plants of this delightful little barberry, now 20 years old, are just 2½ feet high and 4 feet wide in a fertile soil and full sun.

Caryopteris—A shrub of special interest in August and September for its intense blue flower spikes is bluebeard (*Caryopteris x clandonensis* 'Blue Mist'). This is a small grower, 2-3 feet high, with slender branches and gray leaves. It may be killed partly back in a severe winter, but it is best in any case to cut all of the stems to the ground in very early spring. This insures compact, fuller, more floriferous plants. Bluebeard should be planted in groups of three or more for a rewarding airy gray and blue effect in late summer when little else is in bloom.

Corylopsis—Flowering in mid-April, the dwarf winter-hazel (*Corylopsis pauciflora*) has primrose-yellow blossoms that develop in nodding clusters from arching branches. Neater in stature and having more refined bluish-green leaves than other corylopsis species, this relative of the witch-hazel is an attractive spreading, rounded shrub growing 3-4 feet tall and 4-6 feet wide.

Cotoneaster—Rockspray (*Cotoneaster horizontalis*) is a handsome shrub with a horizontal branching habit that lends itself well to use as a rambling ground cover over boulders, slopes, or even as an informal espalier against walls. Its tiny lustrous leaves turn red and orange in autumn and are highlighted by small, bright red berries. The herringbone branching pattern adds winter interest.

Cranberry cotoneaster (*C. apiculatus*) is similar in growth habit to rockspray but has abundant larger cranberry-like red berries 3/8th of an inch in diameter. A densely mounded shrub with recurving branches, it is one of the finest and hardiest for use as a ground-hugging plant.

Early cotoneaster (*C. adpressus praecox*) is a splendid plant forming a dome not over 28 inches tall at maturity. Its small glossy deep green leaves and large showy bright red berries are notable in autumn.

Cyrilla—The southern leatherwood (*Cyrilla racemiflora*) is a striking shrub having small white flowers in drooping clusters of racemes in July. They are borne on current-season growth, and the persisting seed pods are attractive for months. Cyrilla's shiny green leaves turn to brilliant oranges and scarlet reds in autumn when it is planted in a sunny location. Twenty-year-old plants are now 6 feet high. The plant is taller and some-

Roche

Fothergilla's bright spring blooms are a prelude to its yellow, orange and red autumn foliage. Two-season interest is important when space is at a premium.

times treelike in the South, but it may be grown as far north as Boston.

Cytisus—An excellent dwarf spreading shrub, prostrate broom (*Cytisus decumbens*) is a colorful and attractive ground cover with a profusion of bright yellow pealike flowers in May and June. Plants trail along the ground, and the green twigs rise only 6 or 8 inches in height. They are effective all winter. Good drainage and sun are essential.

Enkianthus—The white enkianthus (*E. perulatus*) is not as readily found in nurseries as its attractive taller cousin, the redvein enkianthus (*E. campanulatus*), but it is a gem. It develops into a small, neat, rounded shrub having even more brilliant autumn foliage color. The flowers in early May are white bells in pendulous clusters. A member of the Heath Family and requiring acid soil, it is not grown or used nearly as much as deserved.

Euonymus—The compact winged euonymus (*E. alata* 'Compacta') is an excellent sturdy shrub of particular interest for its ridged twigs and fiery red foliage in autumn. Useful as a specimen or in foundation plantings, it makes a superior hedge that requires little or no clipping. Height is about 5 feet.

Exochorda—*Exochorda x macrantha* 'The Bride' is an attractive form of the pearlbush and is not as tall and leggy as the more common kind, *E. racemosa*. In early May it has long racemes of white flowers that are sometimes 2 inches in diameter. Fifteen-year-old plants are 5 feet high and 4 feet wide.

Fothergilla—The dwarf fothergilla (*F. gardenii*), to 3 feet, is smaller in size than the better known *F. major*, but it is also excellent in bloom and in autumn color. The white thimblelike flowers, which have no petals, appear in terminal heads in mid-May and are interesting. If dwarf fothergilla is planted in the open, or in lightly shaded locations, the leaves turn brilliant yellow and scarlet in the fall.

Hydrangea—The large, bold-textured foliage of the oak-leaved hydrangea (*H. quercifolia*) is useful in the shrub border for contrast. The leaves are indeed lobed much like those of a red oak. When this southern native is grown in the North, it seldom exceeds 3-4 feet in height and is wide spreading. Reddish-purple fall foliage color is best in the sun, although oak-leaved hydrangea will grow well in considerable shade. The large white conical flower clusters last from mid-summer through autumn and turn purple with the leaves. In very cold areas blossoms may not form.

Stephanandra—One of the best of the low-growing shrubs is *Stephanandra incisa* 'Crispa', a fine-textured cultivar of the cut-leaved stephanandra. Plants are spreading, growing up to 3 feet tall and 3-4 feet wide. They have finely cut leaves, slender stems, graceful arching branches and tiny white flowers in small clusters in mid-June. Dwarf stephanandra is an excellent choice for the foreground of a foundation planting, as a specimen, or as a bank-holding plant because it takes root wherever the branches rest on the soil. Easy to grow and to move, this fine shrub is a rewarding addition to the garden. It also lends itself to use as a low, informally pruned hedge.

Viburnums—Valued for their flowers, foliage and fruits, these are very useful shrubs. Of special interest for the small garden is the compact form of the European cranberry bush, *Viburnum opulus* 'Compactum', a plant that may grow to 5 feet in height. It flowers and fruits freely even when young. Do not confuse it with *V. o.* 'Nanum', a dwarf grown only for its foliage.

The diminutive form of Korean-spice viburnum, *V. carlesii* 'Compactum', is extremely tight in growth, ultimately reaching 4 feet in height. Flowers are white and delightfully fragrant as they open from pinkish buds in mid-May.

The earliest of all to bloom, the fragrant viburnum, *V. farreri* (*fragrans*), and its dwarf form (*V. f.* 'Nanum'), are fascinating to watch for in early April as pink buds open to white flowers tinged pink. Though not showy, they have a delicious scent that places them among the most appealing flowers of early spring. In mild climates the blossoms appear in winter and last over a long period. ❧

A Feisty Midget

Most gardeners know the bridalwreath and other spireas very well. These shrubs are dependable bloomers and have a reputation of being toughies in the garden, able to withstand neglect, poorly aimed pruning shears, miserably cold winters and torturously hot summers. One of the best of the lot is a rough-and-tumble midget that answers only to the name *Spiraea japonica* 'Alpina'. Its feisty spirit has been tested at the Brooklyn Botanic Garden for 20 years.

When the Tallman Dwarf Garden was begun, a little plant of this spirea was placed 3 feet away from a young dawn-redwood (*Metasequoia glyptostroboides*), which was included in the garden for scale. Today the dawn-redwood is 50 feet tall and has a trunk diameter of 2½ feet. The spirea is now 1 foot tall and 3 feet across, and holding its ground tenaciously. Despite the high shade and severe root competition from the tree, it bears a fair number of rose pink flowers over a long period in early summer, and the dense foliage is attractive from spring until frost. Perhaps in another 20 years it will need to be pruned. ❧

For a finished effect use . . .

GROUND COVERS FOR SMALL GARDENS

Charles P. Mazza

Whatever the size and shape of a garden, there is usually a role for ground covers to play. To distinguish a garden with a unifying low-growing carpet, the selection of compatible and complementary plants is as important as that of a specimen tree itself.

Often a well chosen and properly maintained ground cover adds a finish to a garden that provides visual excitement and gives depth to an otherwise uninspired design. The small garden is no exception. City spaces or intimate sections of larger gardens can be as striking as large sweeping landscapes if careful attention is paid to the fine details of texture and color.

Perhaps even more important is the structural role ground covers can play in a limited space. Often a small garden is confusing to look at if there are not subtle hints of what the designer intended. However, the eye can be led to a point or direction of interest by a lush planting of a single kind of ground cover widening or narrowing to create the desired effect.

Ground covers serve a practical purpose along with their aesthetically enriching qualities. Weeding, trimming and mowing require very little time if a dense stand of ground covers has been established. In areas too small or too steep to maneuver a lawnmower a ground cover is the perfect choice. Where a uniform, attractive underplanting is desired under the shade of a tree or a building overhang, ground covers may be more interesting than cement or crushed stone. Unusually wet or dry pockets exist even in the small garden and sometimes make a lawn impractical; a ground cover tolerant of these difficult conditions would be ideal.

Paul Frese

Using thyme as a ground cover on garden steps is not only visually interesting, the foliage is extremely aromatic when trod upon.

Charles P. Mazza

Prostrate juniper (*J. horizontalis* 'Wiltonii') readily cascades over a wall, then again will hug the ground as it grows.

Kinds and Uses

Most ground covers are planted chiefly for their foliage: bold or fine textured, variegated, totally non-green, or evergreen. A few that flower conspicuously as an added bonus are periwinkle (*Vinca minor*), carpet bugle (*Ajuga reptans*), thrift (*Armeria maritima*), sweet woodruff (*Galium odoratum,* formerly *Asperula*), leadwort (*Ceratostigma plumbaginoides, Plumbago larpentae* of the trade) and evergreen candytuft (*Iberis sempervirens*). Leadwort, periwinkle and sweet woodruff, all of which are robust growers, are best used in areas defined by a sidewalk or wall to prevent them from encroaching into an unwanted part of the garden. The deep blue and prolific flowering of leadwort in late summer and autumn is reason enough to select this deciduous ground cover, although another bonus is its fall foliage—a brilliant orange-red.

To retain the intimacy of small gardens, ground covers should not as a rule exceed 6-8 inches in height. Vines such as periwinkle, English ivy and vigorous kinds of euonymus should be used with discretion. More manageable and appropriate for small spaces are clump-formers such as blue fescue (*Festuca ovina glauca*), thrift, hosta, big blue lily-turf (*Liriope muscari*) and epimedium (especially *E. grandiflorum*).

Trailing plants may be selected when the ground cover is intended to soften or camouflage a retaining or rock wall. For this purpose: low sedums (sunny sites only), moneywort (*Lysimachia nummularia*) for wet sites, Kew wintercreeper (*Euonymus fortunei* 'Kewensis'), or creeping thyme (*Thymus serpyllum*). Each of these is effective in erosion control on sloping ground.

Sedum acre, S. album, S. sarmentosum and *S. spurium* are useful in a sunny, dry, perhaps even neglected part of the garden. These plants are quick little spreaders, especially the tiny-leaved *S. acre*, but require almost no care except for an occasional curtailment should they creep into parts of the garden where they don't belong. Economy-minded gardeners might note that each of these succulents roots from cuttings with the greatest of ease.

One of the easiest ground covers to obtain in garden centers is Japanese pachysandra (*P. terminalis*), which performs best in shaded or partly shaded areas. The shiny light green leaves become limp on the coldest days of winter but recover quickly when the weather moderates. Pachysandra is most attractive when allowed to form dense mats between shrubs. It spreads by stolons and is easily propagated by division, or even by cuttings placed in a mixture of moist sand and peat. Pachysandra is both reliable and trouble-free in most situations, hence its great popularity. A variegated form is sometimes available.

A reliable and well known ground cover for sun or shade is carpet bugle (*Ajuga reptans*), which is evergreen except in the harsher climates. Attractive spikes of blue-to-purple (occasionally white) flowers in mid-May rise from a tight mat of oval foliage. Plants spread rapidly by runners. Carpet bugle tends to die out in spots from year to year, so it should not be counted on to be a total cover anywhere. However, its informal configuration is quite acceptable in many small gardens, provided plants are kept in bounds periodically. Maroon-leaved cultivars spread a bit more slowly and add color during non-flowering seasons. Their best color develops in sun.

Ground covers with gray or variegated foliage are particularly effective in small areas that need a light color to brighten or break the monotony of green. With few exceptions gray-leaved plants perform best in sun and dry soil. Variegated plants usually benefit from light-to-medium shade in areas where the summer sun is very hot. Let us look first at gray-leaved sorts:

Snow-in-summer (*Cerastium tomentosum*), a well-known rock garden plant, tolerates poor, dry soils and is covered with white blossoms in late spring. It forms a dense little carpet very quickly and must be checked. In the Fragrance Garden at the Brooklyn Botanic Garden it is grown on the top of a wall where it is appropriately contained. Even so, we find it necessary to trench around the plants with a trowel once or twice a year. Snow-in-summer is best kept at least a couple of feet away from other plants.

Blue fescue (*Festuca ovina glauca*) is a popular ornamental grass in California along sidewalks, but it may also be grown in all but the coldest parts of the country with equal ease. It forms 8-inch tufts of attractive foliage and provides a refreshing contrast in texture and color when placed near plants with coarse or maroon foliage. After a few years clumps diminish in vigor and are best divided. Because blue fescue is not stoloniferous, plants should be set close together (about 6 in.) if a carpet effect is desired. In general this grass looks better when grown further apart, the clumps being allowed to assume their natural tufted form.

Euonymus fortunei 'Gracilis' is one of the prettiest variegated vines for ground cover use in small gardens. Let it trail gracefully over a wall in semi-shade. The leaves have white margins and are often tinged pink. They are retained more-or-less year-round except in very cold areas. If scale insects appear, as they sometimes do on euonymus, they can be controlled with a dormant oil spray in late winter.

There are a number of fine plantain-lilies. All are deciduous, and some are variegated. Still one of the best for small gardens is *Hosta undulata,* attractive for

Pachysandra, one of the most dependable of any ground covers, prefers shade or semi-shade.

Grant Heilman

its creamy white, wavy foliage edged with green. Although plants thrive in the filtered light of well-pruned trees, the leaves sometime revert to green in deep shade. In very small spaces *H. undulata* tends to look a little uneven due to foliage variability. Plants are exceptionally winter-hardy and, like most plaintain-lilies, tolerate moist sites.

For a change, gardeners might experiment with silver- or golden-variegated forms of big blue lily-turf (*Liriope muscari*). They are not as hardy as creeping lily-turf (*L. spicata*), which has no foliage variants, and the straplike foliage may suffer winter injury north of New York City, but it can be cut to the ground in early spring. Plants thrive in semi- or dense shade and bloom in late summer.

Woody Plants

The initial sum spent on a garden varies according to design, size and pocketbook. As a rough guide many landscapers figure the cost of ground covers at between 10% and 25% of the total cost of the garden. On the small property, however, one can afford to choose a few luxuries as ground covers. Low-growing cotoneasters and junipers, shrubby plants that require good light and drainage, are initially more expensive than most non-woody covers. They do not spread rapidly, but a well-established group can be a perfect complement to the garden's taller plants.

One should be careful not to choose a cotoneaster or juniper that grows too tall for the site. Bearberry cotoneaster (*C. dammeri*), an evergreen, is the lowest-growing species. It produces lovely white blossoms in May and a bountiful show of red fruit later in the season. *C. adpressus* and *C. apiculatus*, both of which are deciduous, grow a little taller. Creeping junipers such as *Juniperus horizontalis* 'Wiltonii' and 'Blue Horizon' make a beautiful blue-gray carpet to accent a specimen tree or shrub throughout the year. *Juniperus procumbens* 'Nana' is a cushiony evergreen useful in a sunny, rocky site.

Preparation and Care

Setting out ground covers in early autumn or spring, the customary planting seasons, requires planning and preparation. First the area should be completely weeded. Above all, remove the stolons of any perennial grass weeds that may be present. Peat moss or leaf mold should then be thoroughly worked into the soil, along with a general-purpose granular fertilizer such as 5-10-5, to provide a rich and friable medium. (Beware of using compost with weed seeds in it.) The soil should be dug or tilled to a depth of at least 6 inches.

Even after the most careful soil preparation there will still be weed seeds. It is therefore advisable to wait a few more weeks and allow remaining surface weed seeds to germinate and be culled before planting the ground covers. This way at the time of planting weeding will be easy and not disturb the new plants. A light covering of preemergent herbicide such as Treflan, followed in two weeks by an inch or two of fine organic mulch, will be helpful insurance against an invasion of weeds. Each plant should be set in a slight depression in the soil to collect water from rain or the sprinkling can. The mulch should surround but not fill in the depression.

There is no such thing as a completely maintenance-free ground cover. Growing a dense foliage carpet discourages the appearance of weeds in the garden, but one should not neglect the occasional need to hand-weed even an established ground cover. Usually this job is not difficult because the soil is loose.

Every aspect of a small garden needs careful scrutiny. A visit to a botanic garden or arboretum in your part of the country should provide a variety of ideas for the small home garden. Many have well-labeled ground covers in their general collections. A few have distinct areas set aside for them—in California, Los Angeles State and County Arboretum (Arcadia) and San Francisco's Strybing Arboretum; in the Boston area, Case Estates of Arnold Arboretum (Weston); in Lisle, Illinois, Morton Arboretum; in Hamilton, Ontario, Royal Botanical Gardens. All maintain a wide array of ground covers for different sites and conditions. ☘

A Really Wild Ginger

After touring American gardens a horticultural visitor from outer space might jot in his notebook that pachysandra and periwinkle are the only evergreen ground covers that northerners grow. This is not quite the case, but some very good plants have been underlooked. One of the best for small gardens is the European wild-ginger (*Asarum europaeum*). Height: 4 inches. Appearance: very glossy, rounded, somewhat cup-shaped leaves 2-3 inches across. Growth rate and habit: relatively slow and clump-forming. A sharp knife for close division in spring, plus gardener's courage, are needed for a steady increase of the plant. Actually a good clump can be divided within an inch of its life. Reset the divisions 6 inches apart.

Hardiness: can take the winters to at least central Vermont. Requirements: woodsy soil or garden loam with peat moss incorporated. May need occasional watering in summer. Exposure: semi- to fairly deep shade. Essentially a woodland plant. Main problem: uncommon in the trade, as are several other fine evergreen wild-gingers—*A. caudatum* of the Northwest, and the usually mottled-leaved southern species, *A. shuttleworthii* and *A. virginicum*. ☘

From just a few plants (and a vigorous wielding of the knife) you can soon have a whole bed of this delightful, shiny-leaved ginger.

M. Joyner

In rural or suburban gardens of the North . . .

WHAT CAN I PLANT IN THAT SHADY PLACE?

H. Lincoln Foster

Almost every residential property has some area that receives little or no sunshine. This is especially true in city plots where neighboring buildings cast their shadows, but it is also true in suburban and rural properties where the residence itself has at least one sunless exposure and where trees and shrubs in the landscape produce shady patches.

These shady places are frequently thought of as problem areas because grass does not flourish and brightly colored annuals fail to blossom well. Yet there are a host of low-growing perennial plants that do their best in just such shady corners. To be sure, the soil beneath or near trees and shrubs may be rather parched and of low fertility from the competition of roots, and along the north foundation of a building the soil may be excessively well drained or of poor back-fill quality. But with the incorporation of generous amounts of organic material such as compost, leaf mold or peat, and with the addition of some natural fertilizer such as cotton seed meal, most soils can be readily improved in these shady areas to offer a planting site for a varied and charming flora.

The smaller the area, the more discriminating should be the selection of plants. One should strive for a combination of plants of proper proportion, compatability and variety. Ideally the small garden in the shade should provide some succession of bloom, a pleasing pattern of texture and shape, and a sense of unity.

Rather than use the obvious, easy and banal method of planting up such areas of shade exclusively with a solid bed of periwinkle, pachysandra or other ground cover, one should look upon each shady corner as a horticultural challenge. There is an infinite variety of plants available for use in such areas to create a miniature landscape of charm and originality.

Garden Scenes

One thinks almost immediately of a harmonious collection of native woodland plants to bring a touch of natural wildness into the homescape. By careful consideration of the moistness and the acidity of the site one can plan a variety of miniature vegetational habitats. For instance, if the shade is fairly dense and the soil is deep and humusy and on the acid side, one can create a small replica of a woodland nook in the Adirondacks, the White Mountains, or the southern Appalachians. And it is perfectly natural to blend species from all the regions into a composite ecology, because most of the plants at one time or another in the long past have doubtless grown in compatible association.

Here one visualizes in a small garden a blending and running together of partridge-berry (*Mitchella repens*), an evergreen ground-hugging creeper with sweetly scented, white, fuzzy trumpets, always in pairs united at the base to form the long lasting red berries, or white in the rare choice form *leucocarpa*. Here also would flourish the evergreen wild-gingers (*Asarum* or *Hexastylis* spp.) of the southern Appalachians with their bold thickly textured foliage often elegantly mottled with silver. The elfin goblin flowers, brown- and madder-specked thimbles, hide beneath the foliage. In perfect harmony one could plant the rare but exquisite oconee-bells (*Shortia galacifolia*), early in bloom with season-long elegance of evergreen leaf that colors maroon and red in winter. Here also for summer bloom should be scattered plants of creeping dalibarda (*D. repens*) with its white flowers.

To enhance the setting one might bury a few moss and lichen-covered rocks with the surface exposed or place upon the bed small pieces of lichen-covered log or an

Both photos: Gottscho-Schleisner

Daffodils in early spring are followed by ferns, mayapples and epimedium.

old stump. Among these accessories *Tiarella wherryi*, a clump-forming plant, will have a long season of foamy-flowered spikes, pink tinged above lobed arrow-shaped leaves that are frequently splashed with designs of deep red or chocolate. Over a log might ramble a ramification of the ground-hugging twinflower (*Linnaea borealis*) or a clump of trailing-arbutus (*Epigaea repens*). In this special nook of deep, acid and humusy soil one might even attempt the difficult-to-grow painted trillium (*T. undulatum*). As these become established and weave themselves together among the mossy rocks and lichened logs, this small shaded corner of the garden will carry its special and private magic.

One can easily visualize a different but equally entrancing small area, perhaps less densely shaded, beneath a dogwood tree or at the base of a north-facing wall

Ferns accentuated with black-eyed susans.

or building. Here the soil could be less acid, richer in loam than humus, but still open and fluffy. Here could be planted in harmony and proportion a group of early spring woodlanders once again nestling among partially buried rocks or pieces of interestingly shaped wood. Here the natural association might be Dutchman's-breeches (*Dicentra cucullaria*), squirrel-corn (*D. canadensis*), *Hepatica*, spring-beauties (*Claytonia*), and rue-anemone (*Anemonella thalictroides*) especially in that select long-blossoming form, 'Shoaf's Double Pink'. Here also bloodroot (*Sanguinaria canadensis*), again in the special double-flowered form. Include a scattering of *Trillium grandiflorum*, also in the aristocratic double form if you can find and afford it. Other trilliums and trout-lilies (*Erythronium*) in their many species would find the company congenial, plus twinleaf (*Jeffersonia diphylla*) and, if you are not a purist insisting solely on native plants, its lovely amethyst-flowered counterpart from Japan, *Jeffersonia dubia*.

Yet another small scene suggests itself in a shaded nook where the soil is rich and moisture retentive. Here you could have a little woodland corner devoted entirely to primroses. Early in the season would come the English primrose (*Primula vulgaris*), primarily in its classic soft yellow or white flowers with a yellow eye but with perhaps a dash or two of the developed blue cultivars. To accompany these are some lovely Japanese woodland primroses: early pink *Primula tosaensis*, and *P. kisoana* with lavender flowers carried on woolly stems among handsome hairy leaves. The bird's-eye primrose (*P. modesta*), a true miniature in either pink or stunning white form, adds a sprightly touch with tiny flowers held just above a rosette of small leaves dusted with gold specks. To continue the season one should include the ever-satisfactory and reliably easy *P. sieboldii* that comes in many fine shades of pink and white, the blossoms frequently fringed and laced in snowflake designs.

Other Plants for Shade

In fact one could make a very handsome small woodland scene with an oriental flavor by using exclusively plants from Japan. To do so one could plant, along with the primroses just mentioned, *Jeffersonia dubia*, as well as that quaint and stunning Jack-in-the-pulpit of the East, *Arisaema sikokiana;* for summer bloom the low fluffy pink bloom of *Thalictrum kiusianum;* and for autumn a plant or two of the nodding *Anemonopsis macrophylla*. Among these flowering woodlanders could also be planted specimens of the Japanese painted fern (*Athyrium goeringianum* 'Pictum').

Ferns themselves can be made the central theme of a fascinating shady corner if the site is prepared for the smaller woodland kinds. By bringing together a few pieces of weathered limestone or tufa to form a miniature outcrop, crevices and pockets can be made in which to plant the limestone-loving ebony and maidenhair spleenworts, the walking fern, blunt-lobed woodsia and the fragile fern. This corner could be brightened by growing among the rocks the small white-flowered *Sedum ternatum* and the exquisite and winter-hardy African-violet relative, *Ramonda myconii*. Or, for a more brilliant spot of color, include a plant or two of coral bells, either *Heuchera* 'Pluie de Feu' or *H. sanguinea*, or a clump of carmine-red *Astilbe* 'Fanal' or brilliant red *A.* 'Red Sentinel'. For white among the green of the ferns (and nothing is more ethereal in the shade than white) try instead some white astilbe, *Heuchera* 'White Cloud', or a plant or two of *Hosta plantaginea grandiflora*. For an almost tropical effect, tuck in a tuber or two of large-flowered tuberous begonias.

The suggestions above are but hints of the many ways in which a small shady corner of the landscape can be transformed into a unique and delightful miniature garden. By searching nursery catalogs and plant lists found in books on gardening in the shade or gardening with wildflowers, any number of original and pleasing combinations can be designed to create harmonious, varied and well proportioned small gardens in those shady spots so often despairingly thought of as problem sites.

SOLUTIONS TO LANDSCAPE CHALLENGES

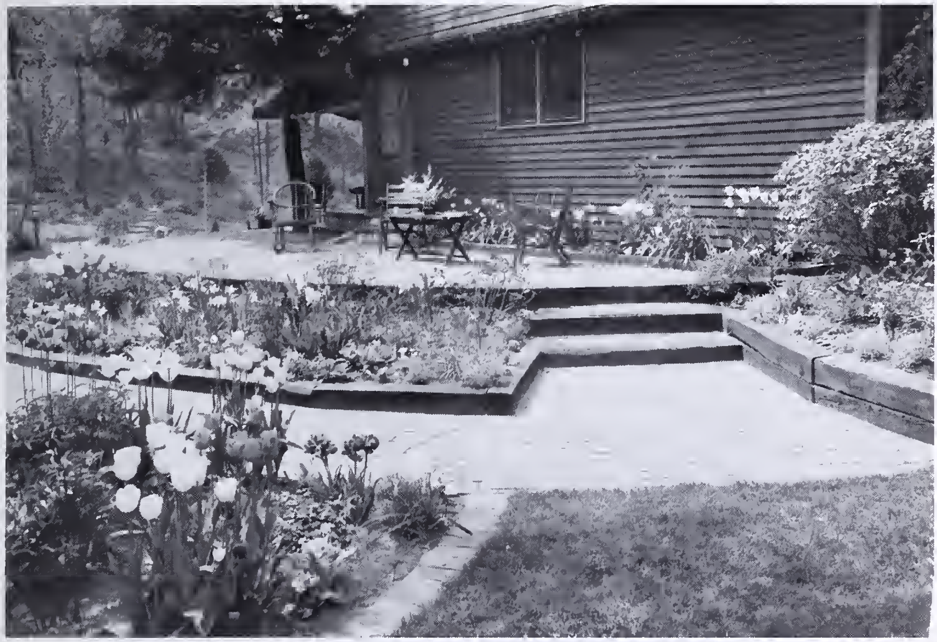
M. Joyner

Left: Ferns, dwarf pines and dwarf rhododendrons help to soften the look of a 6′ rock outcropping. Below: rocks, pebbles and paving give a Japanese stream-bed feeling to this evergreen garden.

Paul Frese

Paving can open up a small area (above) or bring together a large, unfocused area. Where room permits, the use of curves and angles in the design adds further visual interest.

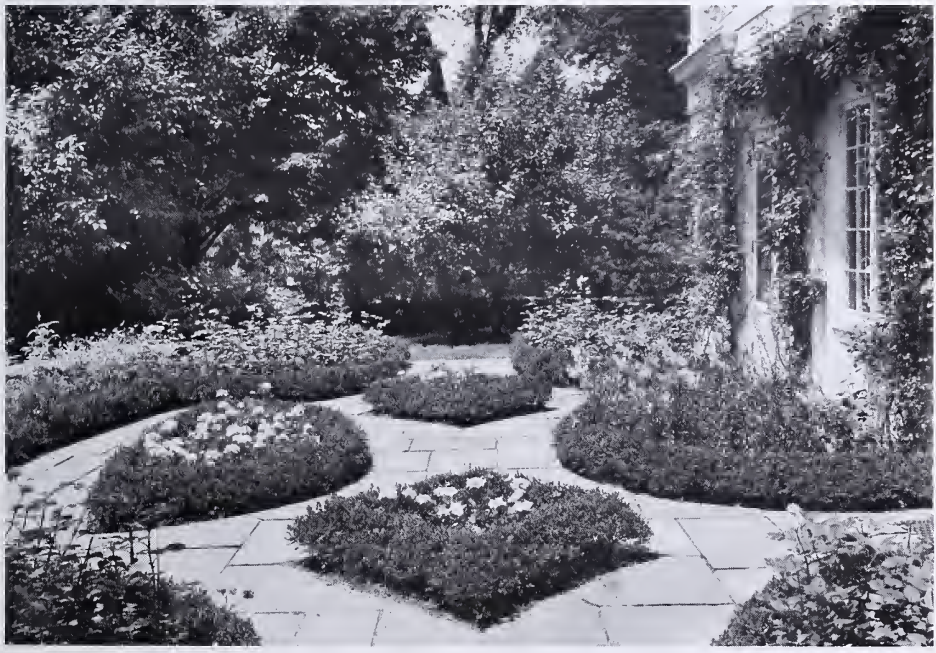
UL: G. Taloumis; UR: Amy Duevell; B: C.M. Fitch



Paul Genereux

Terracing (above) can solve the problem of transition between different levels. Beds of flowers or small trees within the paved area permit highlighting plants or in the case of an herb garden serve to contain and separate the different varieties.

Gottscho-Schleisner



UL: P. Frese; UR: G. Taloumis; C: M. Joyner; LL, LR: A. Duevell. Oppos.: T: M. Joyner; B: Gottscho-Schleisner

Small gardens are ideal spots for the use of pools and garden sculpture because the restricted space assures full appreciation of them. The garden above backs up to woodland, and the slope, culminating in a pool, gives focus and scale to a garden that creates an illusion of much greater depth than is actually the case.

All photos: Gottscho-Schleisner

Flowers provide a che
whether it be the infor
a formal side entranc
lish cottage-type gard

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T: Patrick W. Grace, B: P. Frese

As seen throughout this section, rocks can be a highly decorative accessory to a garden (as well as a herculean task to remove) so you might as well use them effectively. Above, a flower "boat" created from a stone pile. Below, a stone retaining wall becomes a vertical garden with cascades of perennials combined with bedding plants.

For early spring color plant . . .

BULBS FOR THE SMALL GARDEN

Gottscho-Schleisner

Foam flower, Canada mayflower and daffodil naturalized around the base of a pine tree.

Herman Gantner

Masses of pansies and tulips effectively outline the path as well as complementing one another.

Spring is awaited in small gardens as eagerly as in large ones, perhaps even more because they are often located in protected sites next to the house and are pleasant areas to while away an hour or two on mild late-winter or early-spring days. And if the weather is cold, the beginning of the long march to spring can be witnessed from the window. Fortunately, there are many small early-flowering bulbs to brighten the path. Depending on the severity of winter in the Middle Atlantic states or Pacific Northwest, some may start to flower in late January. In colder parts of the North the procession may begin a month or six weeks later, which is still quite early by garden standards.

Different kinds

The earliest and usually most dependable flowerer at the Brooklyn Botanic Garden is a little species crocus from Yugoslavia called *Crocus tomasinianus*, which provides large drifts of light lavender blossoms around the time of January thaw and continues for at least a month. The flowers are tiny compared with those of the later-flowering Dutch crocus (*C. vernus* varieties) that gardeners know best, but they make up for it in numbers. Crocus "T" is one of the best bulbs for naturalizing, even in the small garden. If conditions are to its liking and it reseeds too much for the very fastidious grower, extra bulbs (actually corms) can be easily uprooted and passed over the fence to an envious neighbor whose garden is bleak until April or May.

A number of other dainty little crocus follow fast on the footsteps of *C. tomasinianus*. Among the most distinguished is *C. chrysanthus*, the typical flower of which is light yellow on the inside with brown or purple on the outside, giving a two-toned effect. However, it is a variable species and many cultivars with different flower color have been named. Best look through a well-illustrated bulb catalog to find ones that appeal to your eye. Cloth-of-gold crocus (*C. angustifolius;* formerly *C. susianus*) and the attractive purple-to-white flowering *C. sieberi* are other appropriate candidates.

Snowdrops, both the common one, *Galanthus nivalis,* and the "giant" sort named *G. elwesii* (to 10 in.), have a useful role in the small garden as an accompaniment to the early crocus. Their long-lasting white flowers appear best against a dark green background (a yew or other evergreen), and they can tolerate more shade than most bulbs. In addition mice, chipmunks and squirrels, which hold crocus in the same esteem that most people do with the first batch of asparagus or spring onions, seem to leave snowdrops (also daffodils and scillas) largely alone.

'King Alfred', as well as many other trumpet and large-cupped daffodils, needs no introduction to the gardener, but there are a host of lesser known, small daffodils (including miniatures) that may be more in scale in dooryard gardens. Some of them, including the hoop-petticoat (*Narcissus bulbocodium*), angel's-tears (*N. triandrus*), *N. asturiensis* (*minimus* of the trade) and *N. cyclamineus,* have exquisite little flowers that are best displayed in a raised bed so they can be seen close up. The campernelle (*N. odorus*), a jonquil hybrid, is very fragrant. Larger flowered and considerably more robust, though suited for small gardens, are 'February Gold', which blooms later than its name indicates, and 'Thalia', a good white. As with crocus, scan the catalogs to get an idea of the great variety available. When planting, bear in mind that daffodil flowers customarily face the direction of strongest light.

If yellow and white seem to be the predominant early colors in the garden, there

Crested iris, violets, maidenhair fern and strawberries evoke a feeling of spring in a very limited area.

Gottscho-Schleisner

are good blues, too. Among the best of the small bulbs for this purpose—scillas (*Scilla bifolia* and *S. sibirica*, bright blue; *S. tubergeniana*, light blue); chionodoxa (*C. gigantea*, light blue; *C. luciliae*, lavender-blue); grape-hyacinths (*Muscari armeniacum, M. botryoides, M. tubergenianum);* and puschkinia (*P. scilloides*, light blue). A dozen-or-so of each cost less than a good martini and give longer-lasting pleasure, and most will multiply from year to year.

A word about tulips. No one can deny the beauty of masses of the large, showy hybrid border tulips in mid-spring. The bulbs, however, suffer from the ten-little-Indians syndrome in American gardens, dying out after a few years if rodents don't get them first. For display bloom they are best treated as annuals, which can become an expensive habit should plantings be sizable. Some of the botanical or species tulips are more dependable and in better scale for small gardens, and their range of colors leaves little to be desired. The waterlily tulip (*Tulipa kaufmanniana*), with light yellow and pink flowers in early spring, has a way of persisting in gardens, and so do many of its named hybrids with *T. greigii*. *T. tarda* (*dasystemon* of the trade) with yellow and white blossoms, is a pretty miniature and fairly early-blooming despite its name. *T. eichleri* and *T. praestans* are taller, bearing bright red flowers.

Care and Placement

The prime requirements of most of these bulbs are good drainage, good light when flowering, and a good amount of phosphorus in the soil. The easiest way to correct poor drainage is to build up the flower beds with additional soil. Light is not usually a problem since deciduous trees are still leafless when the small bulbs are in bloom. Avoid planting the bulbs around the base of evergreens where light does not penetrate. Phosphorus, an element that controls good flower and root formation, is best supplied at planting time by deeply digging in some superphosphate; surface application does little good because phosphorus does not work its way down into the soil very well on its own.

The careful placement of small bulbs in the garden can make all the difference in effect. A few bulbs tucked in near a house foundation where they will receive heat and light may flower a couple of weeks before their counterparts in other areas of the garden. Try this with the earliest blooming sorts to prolong the bulb display. Also plant in clumps, with six or more bulbs closely set in informal groups, since solitary bulbs will not attract the viewer's eye. If possible, obtain small bulbs as early as possible in autumn so they will make root growth and be well established by the time winter sets in. Planting rule of thumb: set bulbs in the soil three times as deep as their height.

Very large numbers of bulbs can be a nuisance in the garden after blooms fade because good culture means that foliage should be allowed to ripen and die down naturally, providing nourishment for next year's flowers. Waiting for the leaves to wither in June or even July is a tedious process in the small garden, and there is nothing attractive about the slow yellowing. An overplanting of shallow-rooted perennials, e.g. creeping thyme, low-growing sedums, *Mazus reptans*, or annuals such as portulaca and sweet-alyssum, can partly deflect attention from the aging bulb foliage. Another method is to interplant bulbs among hostas, whose own bold foliage will hide bulb leaves as spring progresses. Because of the modest cost of crocus and their horticultural kin, a few gardeners prefer to treat them as annuals, discarding plants after bloom to avoid foliage jaundice.

Most garden centers offer a fair selection of small bulbs in autumn. A few mail-order sources with good listings are: Blackthorne Gardens, 48 Quincy St., Holbrook, MA 02343 (catalog $1); Daffodil Mart, North, VA 23128 (list); P. deJager & Sons, 188 Asbury St., South Hamilton, MA 01982; John Scheepers, Inc., 63 Wall St., N.Y. 10005; Van Bourgondien Bros., Box A, 245 Farmingdale Rd., Babylon, N.Y. 11702; Mary Mattison van Schaik, Cavendish, VT 05142 (catalog 25¢); Wayside Gardens, 46 Garden Lane, Hodges, SC 29695 (autumn catalog $1); White Flower Farm, Litchfield, CT 06759 ($4).

Paul Frese

Dwarf dahlias (edged with ageratum) are more in scale in a small garden than are their larger kin. They also don't require staking.

Tender Bulbs

Catalogs and garden centers offer many tender bulbous plants which can add color to even the smallest garden plot. Of the lot, a few have special merit. One of the foremost is the fancy-leaved caladium, available in a dozen different leaf-color patterns. Wherever shade is a problem, in the South or North, this tender plant has its place in flower beds, containers and window boxes. The bold leaves hold their color until frost.

Gardeners who feel comfortable about starting plants early indoors under lights or in a little greenhouse can get the tubers into leaf by the time mild planting weather arrives. Otherwise, it is safer to buy plants locally ready to set out. For caladiums, choose a shady place where the soil is rich and reasonably moist.

Another shade-lover is the tuberous begonia, both the exotic large-flowered type and others adapted to hanging baskets, window boxes and containers. Give them mellow soil and be prepared to feed frequently and water often to prevent drying.

Dahlias are fine border plants since they make bushy specimens which bloom repeatedly all summer. Some dwarf kinds are grown from seed, but others are available as tubers. The shortest grow 1½ feet high, others with 4 to 6-inch flowers average 3 feet. The color range is extensive. Most dahlias serve well as accent plants in flower borders or, when grouped, as eye catching central displays. ⁂

For a small garden there are many . . .

PERENNIALS: PLANTS OF A THOUSAND DAYS

Joseph Hudak

Since annuals complete their life cycles in only one growing season—the biennials take two—perennials are an obvious choice for ongoing beauty in the home landscape because they have to last 1,000 days to become members of good standing in this special plant category. It is also nice to know they are economical both to buy and to maintain in the small garden.

There are two types of perennials: woody and herbaceous. Trees and shrubs are the main woody perennials we have, and they differ by maintaining persistent, durable stems and by achieving great heights and spreads. The large group of hardy, herbaceous perennials are plants whose stems and leaves wither to ground level at the end of the growing season—excepting, of course, the occasional evergreen perennial—but maintain living roots through winter's dormancy to grow again the following spring. While hardy bulbs and ferns are also part of this herbaceous collection, space here allows only for a discussion of the perennials which are non-bulbous and true-flowering.

Although "hardy" usually means a satisfactory adaptation to winter cold, any enduring drought, debilitating heat, excessive wind, and diminished light intensity can affect the total hardiness of a perennial. It is wise, then, to know beforehand what growing conditions these plants prefer and those which they would naturally shun. Even the stalwarts of neglect perform better where conditions are to their liking.

The preferred times for planting perennials are either early spring or early autumn, unless containerized plants are available and you can then suit your own planting convenience. Because perennials are more-or-less permanent plants, they should be dug and replanted as soon as possible if field- or garden-grown. The quality of after-care maintenance is an important factor, too, in establishing the plants quickly, and regular watering, weeding, and some cultivation are useful aids to strong growth the first season after transplanting.

Perennials for the most part are vigorous and tend to deplete the soil of nutrients and humus quickly, which suggests that their new planting locations be well-prepared ahead of time by deeply spading or forking generous amounts of humus, compost, peat moss, aged manure, or even seaweed into the bed, and by providing good drainage and sufficient room for them to expand naturally for at least 3 years. Incorporating a slow-acting commercial fertilizer is useful—but not essential—at the time of planting; it is often safer to wait until the following year when the roots are better established for absorbing these nutrients. Finish with a mulch material that is porous and several inches thick to forestall unwanted weeds and to retain soil moisture.

Most perennials benefit from being lifted and separated by their fourth spring-time in one location. Discard any parts which show only weak growth and replant the remainder in fresh soil which has been already prepared for their new expansion. Since some perennials seed themselves prolifically to the point of nuisance, you will have to decide early how much overcrowding you can tolerate and perhaps be ruthless in weeding out the abundance. Such invasive perennials might better be relocated from formal layouts entirely and be given a "wild" area of their own. The majority, however, are neat and tidy.

Using perennials effectively in the garden landscape ought to be limited only by your own imagination. Available from local nurseries, garden centers, by mail, and, of course, from gardener friends, are several thousand types especially suited to dry and moist locations, acid and alkaline soils, and full sun to deep shade. Although the majority are primarily

Paul Frese

Rhubarb in the surprising role of landscape perennial provides color and texture . . . and rhubarb pie.

known for their showy flowering, some, including the hostas, offer noticeable foliage pleasures. Blossom colorings of perennials range through the entire spectrum—not, of course, with each plant type—and normal heights vary from a half inch to as much as 10 feet. A few, such as candytuft, are also evergreen-foliaged, while a small group even provides autumn colorings in their leaves. Such a diverse and rewarding category of plants is well worth adding to your garden.

Perhaps the ideal location for a perennial collection is in a sizable border reasonably free from the invasive roots of mature trees and vigorous shrubs. Here, the deep rooting and logical spread of the perennials can be more readily managed in terms of their own growth habits, but perennials can be incorporated into almost any landscape layout for seasonal color accent, foliage contrast, silhouette, fragrance, and bouquet-gathering. They are the mainstays for a rock garden, ideal as ground covers, cooperative as edgings, and at home with annuals and bulbs. Those perennials with outward-spreading foliage are especially useful in hiding any dying bulb foliage nearby.

Combining perennials with shrubs is a natural association as long as both selections are compatible in their water and light demands. The simple ease with which the entire day-lily group tolerates the root competition of shrubs and small trees is noteworthy. In shady dells, hostas similarly perform with aplomb near other kinds of plants. Small groups of rhododendrons and azaleas in semi-shade are attractive background foils for the low crested iris and foamflower, both blooming in late spring. In full sun, a ground cover such as candytuft offers both evergreen leaves and noticeable flowering in combination with shrubs. Without a doubt, a perennial of attractive interest exists that will enliven any shrub layout.

The enticing scent of *Hosta plan-*

taginea was made for shaded terraces in the August doldrums. Thyme and lavender are too well-known to need further reminders of their heady fragrances in hot, sunny locations. And let us not omit the spicy odors of any of the sun-loving *Dianthus* in their many new hybrid colorings. The bonus of fragrance is yet another perennial benefit.

The following is a sample listing of noteworthy perennials for a variety of growing conditions in the small garden. It is arranged for convenience in a monthly calendar of bloom.

April

Basket-of-gold (*Aurinia saxatilis*, formerly *Alyssum saxatile*), 6-12", sun; bright yellow flowering with gray-green foliage; prefers a sandy-gravelly soil with excellent drainage; available in several shades of yellow.

Wall rockress (*Arabis caucasica*, formerly *A. albida*), 4-10" sun; white blossoms and gray-green leaves; performs best in sandy, well-drained soil in sun-baked locations; several hybrids including a double-flowered one.

Fringed bleeding-heart (*Dicentra eximia*), 12-18"; semi-shade, pinkish-purple flowers and grayish-green foliage which is fern-like; satisfied with a moist, sandy loam; long-blooming and self-seeds readily.

Miniature dwarf Eupogon iris (*Iris pumila*), 4-9", sun; blue, violet, white, yellow, and red colorings; fragrant; enjoys a well-drained, sandy-loam soil enriched with humus; many interesting cultivars.

Moss phlox (*Phlox subulata*), 3-5", sun; pink, magenta or white flowers completely covering the needlelike foliage; thrives in any well-drained, gritty soil; selected color forms are best.

Common lungwort (*Pulmonaria officinalis*), 8-12", semi-shade; blue-violet flowering above light green leaves with conspicuous silver-white mottling; does best in a woodsy, moist location.

May

Allwood pink (*Dianthus* x *allwoodii*), 12-15", sun; 2" flowers in various blends of red, pink and white; very fragrant; needs

Fall aster, a profuse September bloomer, comes in a wide range of colors and heights for a brilliant burst at end of summer.

Joseph Hudak

Joseph Hudak

The loose flower head of anemone-flowered peonies lends a feeling of informality plus the blooms aren't weighed down by rain.

well-ventilated site and well-drained, humusy situation; many cultivars.

Cheddar pink (*Dianthus gratianopolitanus,* formerly *D. caesius*), 6-8″, sun; 1″, rose-pink flowers that are spicy-sweet above evergreen mats of blue-gray, grassy leaves.

Grass or Scotch pink (*Dianthus plumarius*), 10-12″, sun; selections range from pure white to bright red in coloring; clove-scented.

Evergreen candytuft (*Iberis sempervirens*), 9-12″, sun to light shade; white blossoms and slender, evergreen foliage; prefers a rich, well-drained soil that is close to neutral; several named forms available.

Crested iris (*Iris cristata*), 4-9″, semi-shade; lavender-blue color with 4″ blossoms; best in moist, rich, acid-humusy soil.

Allegheny foamflower (*Tiarella cordifolia*), 6-12″, semi-shade; white flowers above attractive, 3″ leaves; best in a cool, moist, humusy soil; several different flower colors are occasionally available commercially.

Germander speedwell (*Veronica chamaedrys*), 12-18″, sun; bright blue florets with a white eye; grows easily in any average, moist soil.

June

Woolly yarrow (*Achillea tomentosa*), 2-10″, sun; canary-yellow flower heads above conspicuously woolly, gray-green foliage; thrives on a sandy, dry soil; the cultivar 'Moonlight' is pale yellow with light green leaves.

Astilbe (*Astilbe* x *arendsii*), 12-18″, semi-shade; plumes of white, pink or red flowers with semi-glossy foliage; needs a very humusy, moist, well-drained location and frequent dividing; many cultivars.

Shasta daisy (*Chrysanthemum* x *superbum*; formerly *C. maximum*), 12-36″, sun to light shading; white, daisy-like blossoms with yellow centers; wants a rich, well-drained, but constantly moist soil and regular division to survive; a broad range of flower types available.

Goldenstar (*Chrysogonum virginianum*), 4-12″, semi-shade; bright yellow, daisy-like blossoms above scallop-edged, dark green foliage, adjusts to any average soil that is not overly limed; a non-rampant creeper.

Wayside Gardens

Hemerocallis 'Primrose Mascotte' is a dwarf form of daylily especially well suited for smaller gardens.

Dwarf-eared coreopsis (*Coreopsis auriculata* 'Nana'), 3-8″ sun; orange-yellow flowers with deep green leaves that often persist in mild winters; easily grown in any average well-drained soil.

Lemon day-lily (*Hemerocallis flava*), 24-36″, semi-shade to full sun; scented, lemon-yellow trumpet flowers with straplike leaves in profusion; easily grown in any average soil that is well-drained.

Coralbells (*Heuchera sanguinea*), 12-18″. sun to light shade; selected forms offer colorings from white to pink to deep red on wiry stems above a rosette of heart-shaped foliage; long-blooming; prefers a moist, rich, and well-drained location.

Siberian iris (*Iris sibirica*), 24-36″, sun to light shade; mostly blue, purple and white 3″ flowers; does best in a moist, humusy, acid soil; many cultivars.

Phlox carolina 'Miss Lingard', 12-30″, sun to light shade; pure white flowers, glossy foliage; likes a well-drained, airy, moist location liberally enriched with humus.

Spike speedwell (*Veronica spicata*), 12-24″, sun; bright blue with several pink cultivars; any average soil that is well-drained.

July

Aster x *frikarti*, 24-30″, sun; lavender-blue, daisy-like flowers that persist for months; grows well in any average, well-drained soil.

Baby's-breath (*Gypsophila paniculata*), 24-36″, sun; tiny white flowers and gray-green foliage which can be winter-dried for indoor use; needs dry, average soil; several hybrid improvements available.

Plantain-lily (*Hosta*), 12-36″, semi-shade to full shade (with reduced flowering); lilac to lavender florets on thin spikes, durable in any site but prefers a moist, humusy, well-drained location; many species and hybrid types in the marketplace; foliage colorings offer a bonus.

White stonecrop (*Sedum album*), 4-8″, sun; airy clusters of star-shaped flowers generously appear above sausage-shaped, tiny leaves of this dependable perennial; a light, sandy soil encourages rapid growth.

Orange stonecrop (*Sedum kamtschaticum*), 4-9″, sun; golden yellow, 3/4″ flowers come in large clusters atop bright green, 1½″ leaves; the spent flowers darken to deep red and remain effective all season; does well in any average soil and will tolerate light shade.

August

Plantain-lily (*Hosta*), 10-20″, semi-shade to full shade; additional species with violet, white or violet-white flowers; same culture as the July types.

Showy stonecrop (*Sedum spectabile*); 18-24″, sun; numerous variations with red or deep pink flower color; thick, succulent foliage; does best in a heavy, clay soil.

September

New York aster (*Aster novi-belgii*), 24-48″, some dwarf forms; sun; extensive color range in hybrids from blue to pink to red to white; any moist, average soil is suitable.

Hardy chrysanthemum (*Chrysanthemum* x *morifolium*), 9-42″, sun; every color but blue; amazingly long-lasting in bloom; thrives in a rich, well-drained but constantly moist soil. ❧

Choosing the appropriate . . .

ANNUAL FLOWERS

Paul F. Frese

Annual flowers are indispensable elements in small gardens. No other group of plants can supply such continuous color throughout summer and early autumn. In fact, in mild climates, hardy varieties may even be the principle source of brilliant winter bloom.

Since many kinds are tailored, by size and habit of growth, to make neatly branched plants covered with flowers, these annuals are prime subjects for mass planting wherever the impact of solid swathes of color is desired.

Much of the philosophy of creating patterns with complementary patches of color as seen in public parks, shopping malls and landscape planting in office parks can be adapted easily to small landscape designs. There are many situations where the bold use of color is exciting, as in beds surrounding a patio, sweeping borders of annuals in front of screen plantings of shrubs and hedges, along a walk or drive, or in front of fences, walls or against the side of a garage.

Catalog descriptions of annuals may usually be taken quite literally as to height and spread of plant, flower size and color. Variations caused by climate, soil and weather conditions are only relative. The most important consideration from a design standpoint is to arrange annuals in such a way as to preserve the proper scale so that when blue ageratum and dwarf yellow marigolds are grouped together, for example, they are of equal heights.

When annuals are interplanted in flower borders between spring bulbs, perennial clumps and low shrubs and evergreens, the general effect is enhanced when a fair number of plants of one color or variety are clustered together. This dramatizes the color scheme, and overcomes a common fault of scattered blossoms in border plantings.

We see on every hand how successful a number of annuals are when grown in window boxes, planters and containers. Since few plants are required in each instance, and immediate color is of prime consideration, plants already started and then set in good soil enriched with long-lasting fertilizer, are the rule.

In summer, annuals may be a prime source of cut flowers for indoor or outdoor living area decoration. Most annuals respond quickly by branching from below when a topmost bloom is cut.

Wherever space permits, annuals may be grown in short rows for cutting, as along the edge of a little vegetable garden. Otherwise, when popular cut-flowers such as marigolds, zinnias, asters, petunias, snapdragons, cosmos, pinks and dwarf celosia are planted in large clumps in borders, flowers can be gathered freely without diminishing the overall landscape effect.

'White Cascade' petunias are particularly suitable for growing in hanging baskets.

Pan-American Seed Company

There are scores of annuals which are of modest size, neat in habit, and adaptable as landscape material for small properties. The annuals listed below are typical of kinds which, by reason of their neat habit, size and proven ability to bloom profusely, are good choices.

For Small Properties

Ageratum—'Blue Blazer', clear blue, 5 in.; 'Royal Blazer', deep purple, 5 in.; 'White Blazer', snow white, 6 in.; 'Blue Tango' is a fine light blue, 8 in.

Alyssum, Sweet—'Carpet of Snow', white, 4 in.; 'Royal Carpet', deep purple, 4 in.; 'Rosie O'Day', rose pink, 4 in.

Aster—'Color Carpet', 8 in.; 'Dwarf Queen', 10 in.; 'Munster' series, 12 in.; 'Red Mound', 14 in.; 'Pinocchio', 16 in.

Begonia, Fibrous rooted—Assorted colors, light or dark foliage: low 6 in., medium 8 to 10 in., tall 12 in.

Celosia—Plume type. 'Fairy Fountain' mixed, wide color range, 12 in.; 'Fiery Feather', brilliant red, 12 in.; 'Orange Feather', 10 in.; 'Golden Feather', golden yellow, 14 in.; 'Red Fox', scarlet, 18 in.; 'Forest Fire', blood red, 24 in.

Cleome—'Rose Queen', deep rose, 36 in. 'Helen Campbell', white 36 in. For tall accent planting.

Coleus—Separate leaf colors, both broad-leaved and deeply serrated, available in clear and mottled colors, from light to deep tones. Ideal for shade and in planters.

Dahlia—'Rigoletto', mixed colors, 14 in.; 'Red Skin', dark-leaved mixed, 25 in.; 'Early Bird' and 'Dwarf Exhibition', 15 in.

Geraniums—Named varieties. Also seed-grown hybrids such as the 'Sprinter' series including 'Showgirl' rose-pink; and the 'Carefree' series, each in separate colors.

Gloriosa Daisies—Single, semidouble, double in yellow, gold, mahogany. 5 in. blooms, plants 3 ft., good for bold masses, cutting.

Impatiens—Dwarf types include the 'Elfin' series and 'Imp' series in separate colors. The 'Futura' series has larger 2-inch blooms, excellent grown in containers, hanging baskets. 'Fancifrills', fully double from seed. Grow impatiens in shade except the New Guinea hybrids, noted for their large flowers, strong growth and often variegated foliage.

Marigold—There is endless selection. Dwarf class up to 12 in. 'Brownie Scout', 'Dainty Marietta', 'Nugget' series, 'Red Glow', 'Bolero', 'Aquarius', 'King Tut', 'Red Seven Star'.
Intermediate size, up to 22 in. 'Lady' series, 'Moonshot', 'Apollo', 'Space Age', 'Gold Galore', 'Honey Moon'. Tall marigolds. 'Jubilee' hybrids, 'Crackerjack', 'Gold Coin', 'Climax' series, 'Happy Face'.

Morning-glory—'Heavenly Blue'. Best annual vine.

Nicotiana—'Nicki' series, pink, rose, white. Day-flowering.

All-America Selections

Dianthus 'Magic Charms', a colorful, fragrant annual, mixes readily with other flowers or can be used in massed plantings.

Paul Frese

The wide variety of forms of marigold give it a multiple role in the garden. It can be headliner or accent plant in border or background.

Pansy—Ideal for spring and early summer bloom. Both large-flowered varieties with markings and solid colors.

Petunias—The F_1 hybrid Multifloras are highly recommended since the plants are compact and bloom profusely. Multifloras: 'Joy' series, 'Satin' series, 'Sugar Plum', 'Purple Plum', 'Comanche Improved', double 'Cherry Tart'. For planters, window boxes, in addition to Multiflora varieties, the Cascades are especially good.

Phlox, Annual—'Dwarf Beauty' series; 'Globe' mixed; 'Twinkle', star-shaped flowers.

Portulaca—Double, mixed or in separate colors. Excellent in hot sunny places.

Salvia—There are scarlet varieties in varying heights: 'Scarlet Pygmy', 6 in.; 'St. John's Fire', 12 in.; 'Blaze of Fire', 14 in.; 'America', 18 in.; 'Bonfire', 2 ft. Also pastel and purple colors, suited to shady places.

Snapdragon—Although the very dwarf 'Floral Carpet' type makes a good solid bed, taller kinds are more vigorous: the 'Carioca' series, 'Little Darling', 'Sweetheart'. For background planting, use taller kinds: the 'Rocket' series, bellflower hybrids, giant 'Tetras'.

Verbena—The 'Sparkle' class. Also 'Blaze', bright scarlet.

Vinca, Annual—Dwarf varieties, in mixture or separate colors: 'Little Pinkie', rose-pink; 'Bright Eyes', white with rose-red eye. Stands hot and dry or shady and moist conditions.

Zinnia—The 'Peter Pan' series in separate colors (12 in.); 'The Buttons' (10 in.); and for background planting 'Scarlet Ruffles'; 'Zenith' hybrids; 'Wild Cherry'; 'State Fair'; 'Whirligig'.

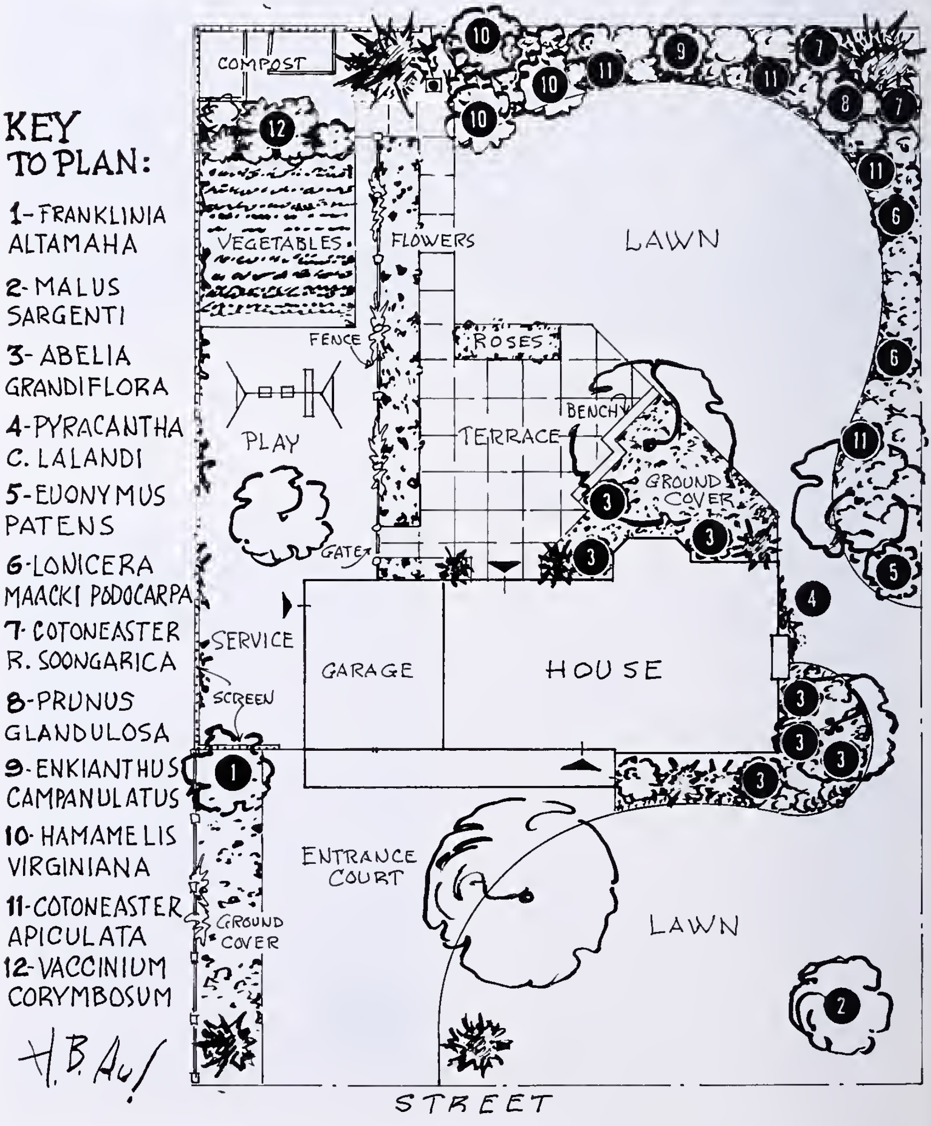
Annuals for part shade: begonia, browallia, coleus, impatiens, nicotiana, pansy, torenia, vinca. ❧

LANDSCAPE DESIGNS FOR SMALL AREAS

Henry B. Aul

The first step in designing a landscape in a small plot is to get it down on paper. On this and the following pages are concepts designed by Henry B. Aul, former Garden Editor of the N.Y. *Herald-Tribune* and prominent landscape architect, on how to plan small gardens and garden areas to embody various ideas, effects and needs utilizing the land area in such a way as to obtain the greatest utility out of the least space.

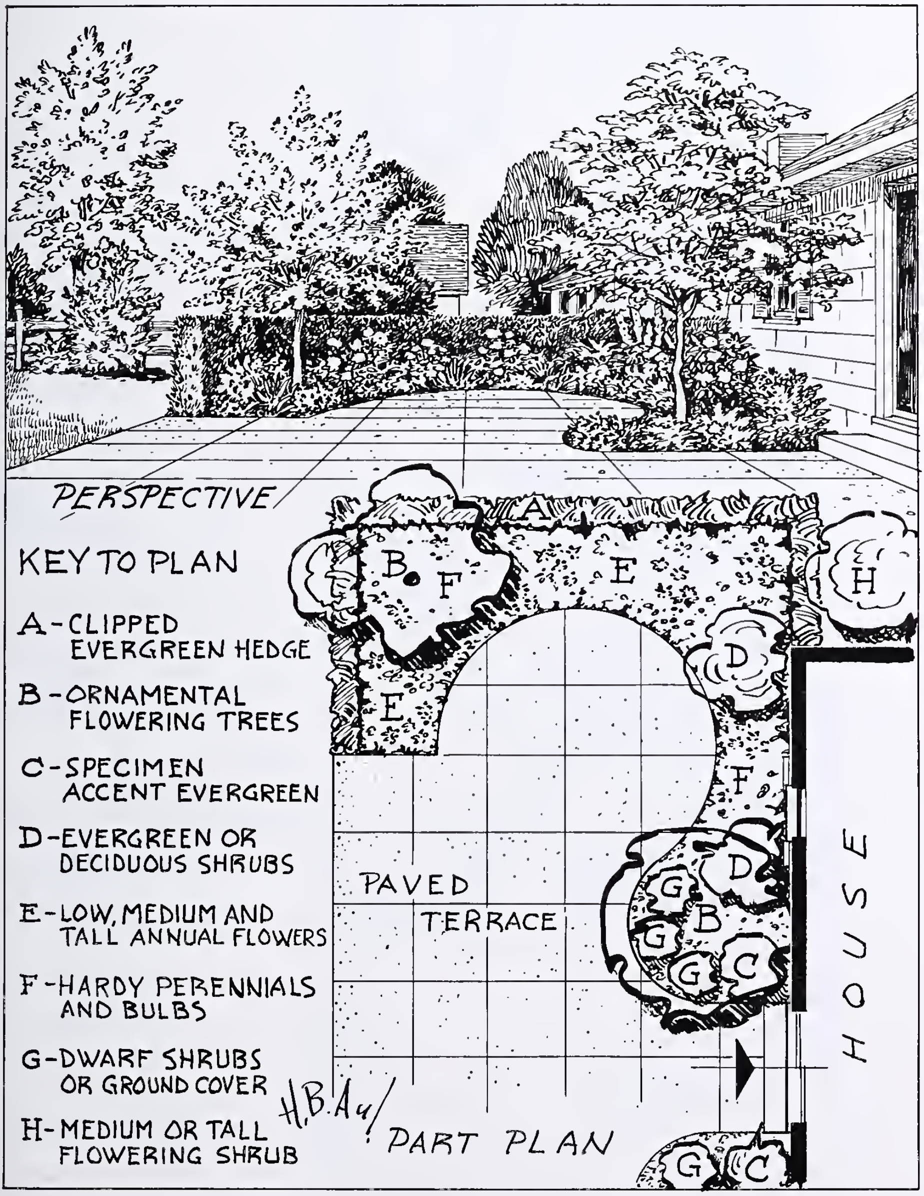
Below: A narrow, deep property accommodates the family's needs for a garden, play area, lawn and terrace, and entry and service areas. Flowering trees and shrubs (some winter blooming) assure year-round interest.



Below: A sheltered patio area combines evergreens, small flowering trees and shrubs and flowers to give privacy as well as visual interest.

p. 58: A narrow, difficult side area becomes a small, delightful garden with winding paths and sawtoothed fence to counteract the linear feeling. Plants of varying heights to overcome the possible tunnel effect.

p. 59: A miniature arboretum with asymmetrical lines for visual interest can turn a narrow, deep lot into a showplace.


PERSPECTIVE
KEY TO PLAN
A-CLIPPED EVERGREEN HEDGE
B-ORNAMENTAL FLOWERING TREES
C-SPECIMEN ACCENT EVERGREEN
D-EVERGREEN OR DECIDUOUS SHRUBS
E-LOW, MEDIUM AND TALL ANNUAL FLOWERS
F-HARDY PERENNIALS AND BULBS
G-DWARF SHRUBS OR GROUND COVER
H-MEDIUM OR TALL FLOWERING SHRUB
A
B
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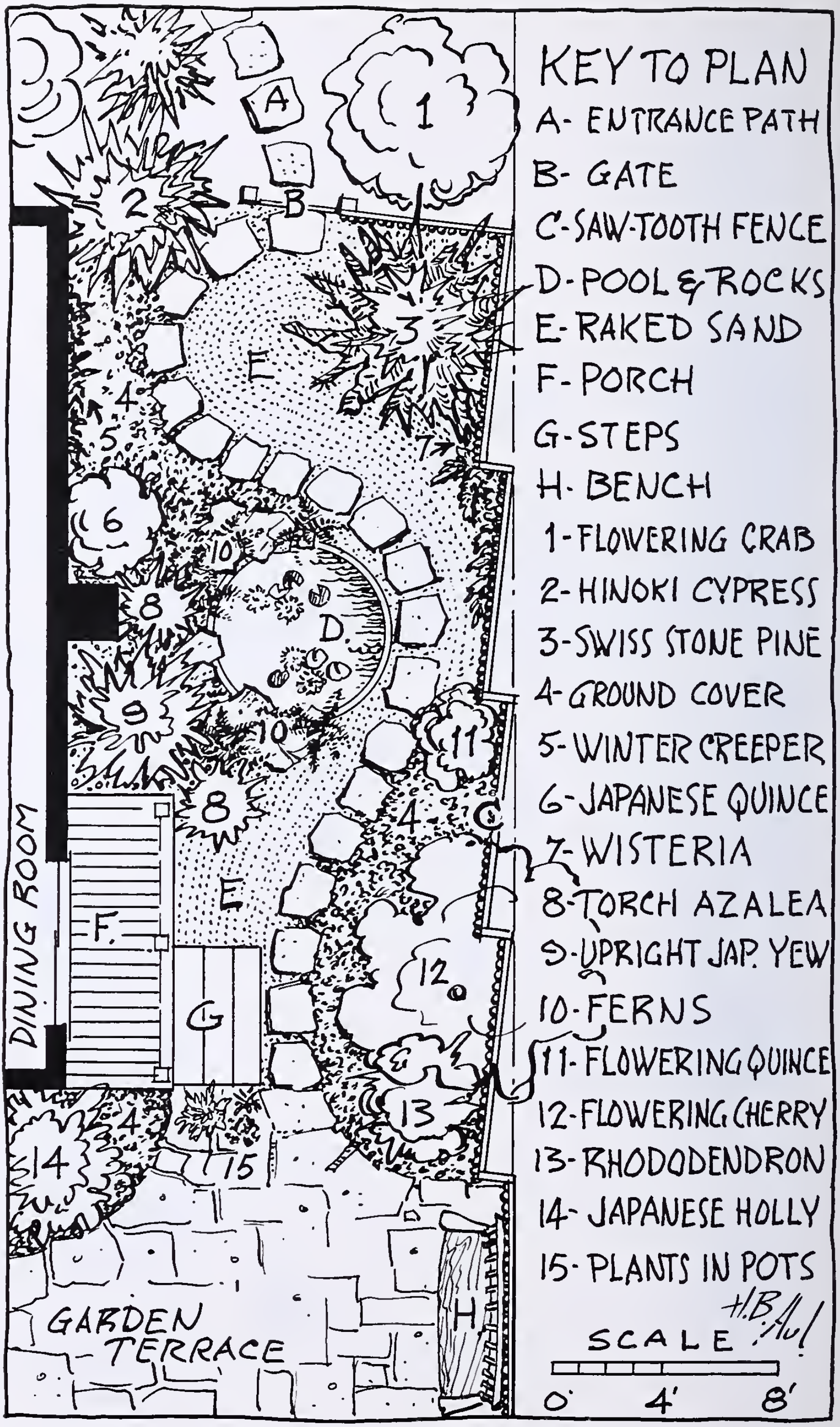
KEY TO PLAN
A- ENTRANCE PATH
B- GATE
C-SAW-TOOTH FENCE
D-POOL & ROCKS
E-RAKED SAND
F-PORCH
G-STEPS
H- BENCH
1-FLOWERING CRAB
2-HINOKI CYPRESS
3-SWISS STONE PINE
4-GROUND COVER
5-WINTER CREEPER
6-JAPANESE QUINCE
7-WISTERIA
8-TORCH AZALEA
9-UPRIGHT JAP. YEW
10-FERNS
11-FLOWERING QUINCE
12-FLOWERING CHERRY
13-RHODODENDRON
14- JAPANESE HOLLY
15- PLANTS IN POTS
H.B.Aul
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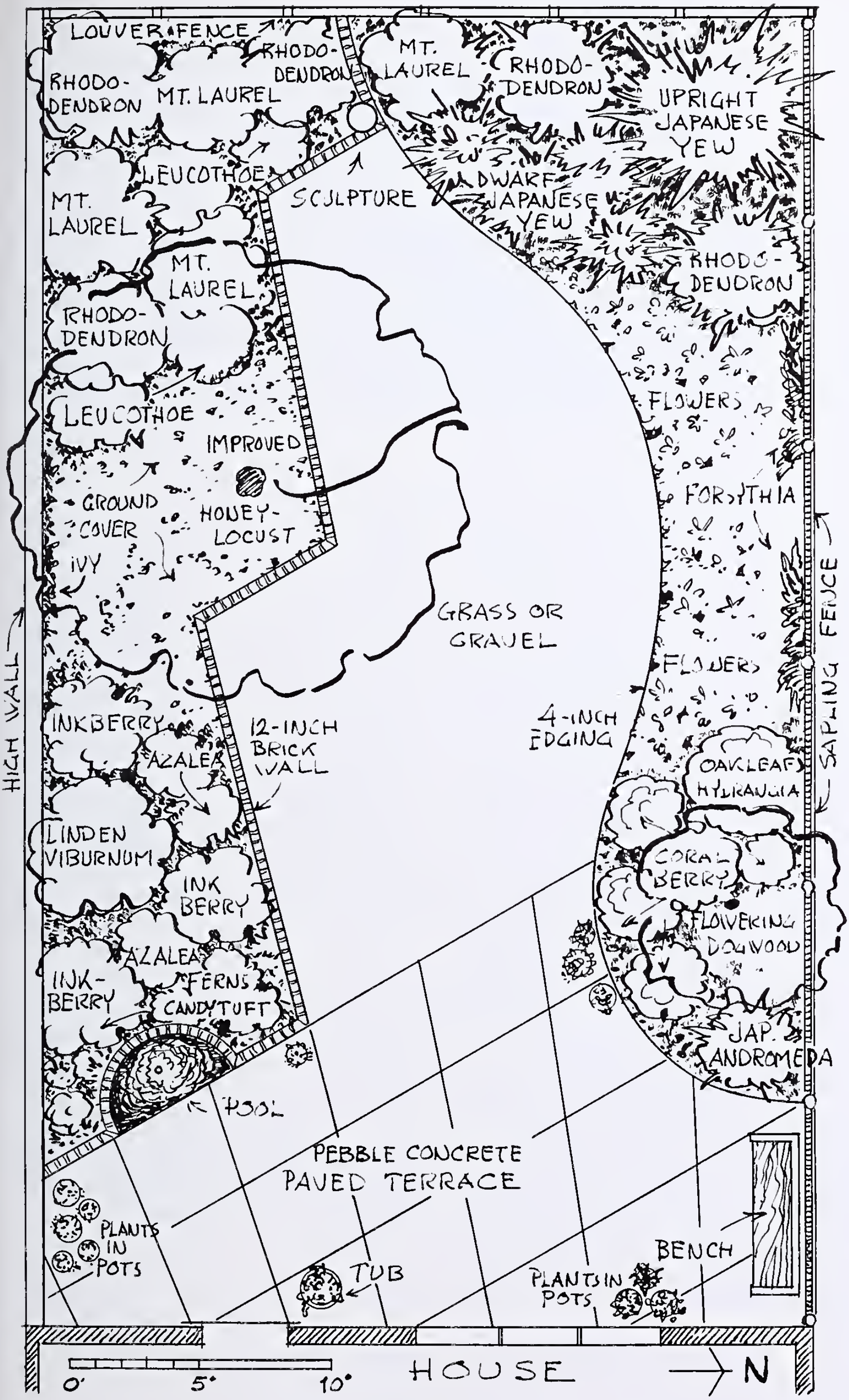
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MT. LAUREL
RHODODENDRON
UPRIGHT JAPANESE YEW
LEUCOTHOE
SCULPTURE
MT. LAUREL
DWARF JAPANESE YEW
MT. LAUREL
RHODODENDRON
RHODODENDRON
LEUCOTHOE
FLOWERS
IMPROVED HONEY-LOCUST
GROUND COVER
IVY
FORSYTHIA
SAPLING FENCE
GRASS OR GRAVEL
FLOWERS
HIGH WALL
4-INCH EDGING
INKBERRY
AZALEA
12-INCH BRICK WALL
OAKLEAF HYDRANGEA
LINDEN VIBURNUM
CORAL BERRY
INK BERRY
FLOWERING DOGWOOD
AZALEA
INK-BERRY
FERNS
CANDYTUFT
JAP. ANDROMEDA
POOL
PEBBLE CONCRETE PAVED TERRACE
PLANTS IN POTS
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A garden potpourri of . . .

HERBS YOU CAN'T DO WITHOUT

Elizabeth Remsen Van Brunt

Winter evenings can be the perfect time to plan a garden on paper. Limited space may be an asset, not a problem, for it will prevent overcrowding as well as too much upkeep on your part. First, list only those herbs you are apt to need in cooking or for fragrance. Then draw a plan of the space to be used—square, oval, oblong or just a wide border by the kitchen door. Write in the herbs you must have, leaving a narrow edging space for either very useful herbs such as thyme and chives, or those which are decorative both winter and summer. Among the latter might be germander (*Teucrium chamaedrys*) with dark green foliage and santolina (*S. chamaecyparissus*), which has a pale gray cast. For best appearance these two should be clipped to a slightly rounded 5-inch height twice during the summer.

Place the herbs according to their general height and convenience for use as well as growth appearance, and remember that most of them need all the sun they can get. If you want a really decorative garden, add a center bed with sundial, pool, perhaps grass or paving stones or brick surrounding the center. Put an elder (*Sambucus*) in a far corner, as all herbs are under the protection of the Elder Tree Mother. The elder of the Ancients is a tall European kind, *S. nigra,* that is hard to find in American nurseries, but if you substitute a shrubby native one, *S. canadensis,* perhaps there will be some protection, too. At least this plant will provide height as well as light shade. In the other corner have one of the old shrub roses—*Rosa gallica, R. damascena* or another favorite, the sweetbrier (*R. eglanteria*), because of the delicious scent of its foliage on a rainy day. Probably the herbs a devoted kitchen gardener cannot do without will amount to 25, which sounds like an astronomical number for a small area, but consider what can be omitted. Others can be added later.

For Cooking and Fragrance

(Please note code after botanical name—*A*, an annual herb; *B*, biennial; *P*, perennial.)

Anise (*Pimpinella anisum*) is a wispy annual but if you are a baker of cookies, this or caraway is important. For restful sleep, try a teaspoonful of aniseed in very hot milk on going to bed.

Absinthe wormwood (*Artemisia absinthium* P.) grows to 2-3 ft. and has finely cut, pale gray foliage with a bitter flavor that is interesting if finely chopped leaves are blended in a frozen daiquiri. Use 2 leaves to a quart of frozen mush, made with 1 tin limeade concentrate, 2 tins water and 1¼ tins white Bacardi rum. Store in freezer in glass jar. Serve frozen on a hot day. It melts as sipped.

Lemon balm (*Melissa officinalis* P.) Attains 18-24 inches and needs occasional curbing since it is a rampant grower. Leaves are delicious in iced drinks or as a hot tea. Combats melancholy, and to wear a leaf of balm makes one beloved.

Sweet basil (*Ocimum basilicum* A.) Sow the seed after all danger of frost has passed. The seasoning best used with cheese and tomatoes. Good with eggs to begin the day cheerfully. Dry the leaves for winter use. Several varieties—*O. basilicum* 'Minimum', sweet, and a tiny leaf; 'Dark Opal', an effective deep purple; lettuce-leaf basil, a large crinkly leaf delicious (as all the others) in salads. Basil grows about 18 inches tall.

Bay (*Laurus nobilis*), which is a woody plant, will be a decorative addition centered in the background of a border. One's own bay leaves are most pungent for soups and stews as well as other meat dishes. Bay must be wintered indoors except in mild climates.

George Taloumis

Ideal to use in a garden with colonial design, herbs can be tucked into very small spaces or interplanted with other plants. There is almost no reason why they cannot be incorporated in any garden of any size.

Burnet (*Poterium sanguisorba* P.) is a charming low-growing plant, a true perennial if the flower stalks are kept cut back so it does not seed. The tender, round, pinked-edged leaves, stripped from the stem, add a delicious cucumber flavor to a salad.

Comfrey (*Symphytum officinale* P.) has attractive foliage but do not allow it to take over the garden or plant it near delicate herbs. Hardy souls assert that comfrey keeps them healthy—one leaf steeped in tomato or orange juice for breakfast. Effective as an accent plant, or in the background. It is shade tolerant.

Caraway (*Carvum carvi* B.), like most herbs, grows best in a sunny spot. It flowers and sets seed in the spring of the second year after sowing. For cookies, cheese and in sauerkraut.

Chives (*Allium schoenophrasum* Per. bulb) will take over the garden if allowed to go to seed, so cut the tops of plants back after the dusty purple bloom has faded. When using the leaves for a mild onion flavor, cut them with sharp shears; being tubular, they do not chop easily. Chives make a nice edging. Another plant with charm and color as an edging, also as an accent, is the clove carnation (*Dianthus caryophyllus* P.), which forms a grayish clump.

Dill (*Anethum graveolens* A.) must be cut for drying foliage and gathering the savory seed just when the seeds are well formed. Dry the seeds on paper in the house so they are not lost. Useful for pickling cucumbers, dill also enhances creamed potatoes and fish dishes.

Elder (*Sambucus canadensis*), if planted in the corner as earlier suggested, will supply clusters of bloom for fritters. Soak the flowers in a cup of brandy before coating them with batter. Serve them with a dash of sugar and orange juice. Also, the berries are good for pies, and both flowers and berries for wines.

Lavender along the back of an herb border is guaranteed to winter well if its roots are protected near rock. Grind raw eggshells and dig them in around this low shrub; it thrives with the calcareous mixture. English lavender (*Lavandula angustifolia*), which herb gardeners often still call *L. vera*, has the most delicate scent of the several kinds grown in gardens. Gather the stems when the first bloom shows, strip off stems when dried, and make sleep pillows of the lavender and dried leaves of lemon-verbena.

Two plants of **lemon-verbena** (*Aloysia triphylla*), a woody though tender shrub, are not too many in the smallest of gardens. It is a favorite with most visitors, especially men. A traveler to Peru records a lemon-verbena tea and bath bags of chamomile and lemon-verbena to steep in a hot tub for relaxing taut muscles after a tiring day. This plant, known to gardeners for many years as *Lippia citriodora*, must be potted for overwintering indoors except in mild climates.

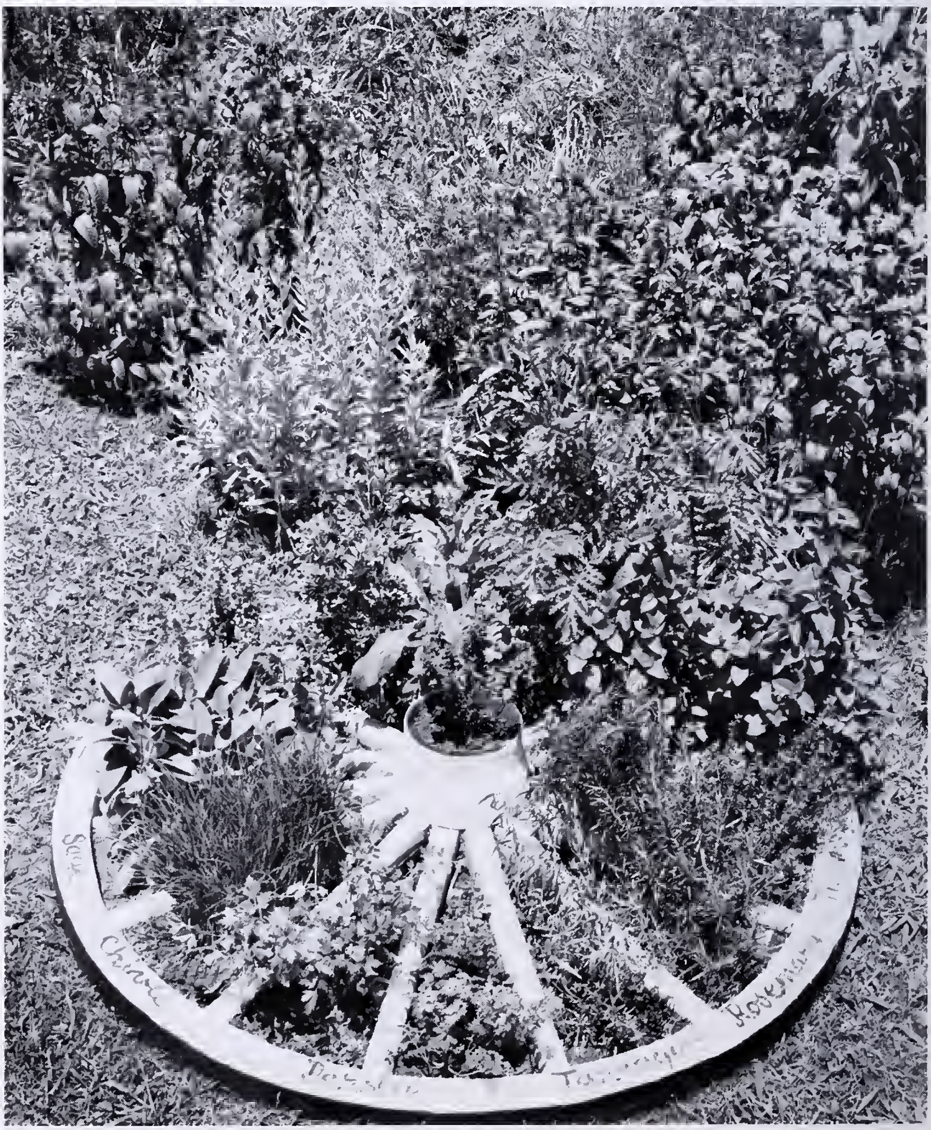
Lovage (*Levisticum officinale* P.) if given a rather rich loam, is an easily grown substitute for celery. Both stalks and leaves are used. Lovage grows 3-4 feet tall, so should be planted in the rear of the border.

Sweet marjoram (*Origanum majorana* A.) grows only 8-12 inches tall. In certain districts of Italy it is known as oregano, in another district thyme, and in still another, winter savory is the oregano, so called! Sweet marjoram is indeed the sweetest. It is pleasantly pungent with meats and also good with mushrooms.

Spearmint (*Mentha spicata* P.) is excellent for juleps and for sauce for lamb, peppermint (*M. piperita*) for tea and confections. Instead of coffee the latter is delicious as an after-dinner drink sweetened with honey. "Stimulates the brain," wrote the Elder Pliny. Orange mint (*M.*

An old wagon wheel gets a second life in this effective display and method of growing herbs. A planting wheel of herbs could be part of an overall garden design.

Gottscho-Schleisner



piperita citrata) grows well in the shade of the sweetbrier rose. Keep the mints in a garden separate or they will hybridize, and give them ample moisture. They usually require annual division in spring for thrifty growth and to keep the roots in bounds.

The **sweetbrier** or **eglantine rose** (*Rosa eglanteria*), has a pale pink single bloom and will eventually grow 5 feet tall, but cut it back regularly or it will flower only at the tips and become leggy.

Parsley (*Petroselinum crispum*), which flourishes in sun or part shade, makes an attractive bright green clump. Some gardeners grow it as an edging plant. It is best near the kitchen door for easy snipping when needed. Parsley seed goes to the Devil seven times and back before germination, so if soaked in very hot water before sowing where it is to grow, the process is hastened. Thin out the seedlings carefully. Older specimens do not transplant well because they develop long taproots, but try to dig and pot up a plant or two in autumn for use on the kitchen windowsill.

Common sage (*Salvia officinalis* P.) has a reputation as a digestive for rich meats and as a cure for chest colds and sore throats. A time-honored expression is, "How can a man die who has sage in his garden?" The leaves also make a stimulating hair rinse for brunettes. Sage may sprawl in the small garden, but a periodic clipping keeps it tidy and thrifty, and the gray-green foliage is most attractive.

Rosemary (*Rosmarinus officinalis* P.) is a tender shrub in the northern states. The leaves, as are those of sage, are useful in a hair rinse to massage the scalp. A plant should be potted and wintered indoors, and misted with water several times a week to keep it healthy, or otherwise kept in a very humid atmosphere. With chicken, lamb or pork, rosemary is a pleasant seasoning, and to sleep with a sprig on the pillow brings pleasant dreams.

Winter savory (*Satureja montana* P.) is a hardy little shrub up to 2 feet tall. The small peppery leaves were the traditional 'bohnenkraut' used for seasoning string beans before pepper was brought from the Indies.

Sorrel (*Rumex acetosa* P.) is an indispensable herb. It attains 2 feet in height and has a coarse texture. The leaves are refreshingly sour in salads and are a component of the delicious *potage germiny*, a cream soup made with chicken-stock base, sorrel cooked in butter, and egg yolks and cream to finish.

Tarragon (*Artemisia dracunculus* P.) is another special salad herb, and its foliage is important for making a well known vinegar. Steep a jarful of tarragon sprigs in white wine vinegar for a week or ten days. Strain, reserving the vinegar for salads and keeping the pickled leaves for use with eggs, cheese or tomatoes. Tarragon grows about 2 feet tall.

Thyme (*Thymus vulgaris* P.) needs good drainage or the roots will rot. It provides a pleasant, useful edging growing about 6 inches tall. Creeping thyme or mother-of-thyme (*Thymus serpyllum*) has a wiry leaf and is useful between flagstones or as a ground cover in a small area. It is not as sweet as common thyme for seasoning.

Sweet woodruff (*Galium odoratum;* formerly *Asperula odorata* P.) deserves a spot under the elder because it thrives in the shade. There will be starry white bloom for the maibowle on the 1st of May. Concocted with white wine, woodruff sprigs and wild strawberries, the maibowle will have the elusive fragrance of new-mown hay.

There are the 25 herbs (approximately) for the small garden. Add or substitute if you will, rose geranium (*Pelargonium graveolens*) and/or peppermint geranium (*P. tomentosum*), both effective foliage accents in the garden and for delight in the house, as they must be potted for indoors in the winter. Other substitutes might please: borage, chamomile, chervil, true myrtle, Corsican mint, sweet cicely. All of them are too many—and too much—for a small garden, but do consider their merits as replacements, or if your family develop allergies, or preferences, loathing or liking! ⁂

All photos: Charles Marden Fitch

MINIATURE ROSES FOR LITTLE GARDENS

Charles Marden Fitch

Miniature rose bushes are ideal flowering shrubs for little gardens. Modern hybrids come in more than 300 different registered clones with about 150 easily available. You will find an incredibly rich selection of colors, shapes, and sizes. Some miniature roses have ½ inch flowers on an 8 inch shrub while others produce 2 to 3 inch flowers on a vigorous 24 to 36 inch shrub.

Pure colors and unusual color blends make even a small collection of mini roses a fascinating display. Most mini hybrids are fragrant, pick well, and bloom from mid-spring until stopped by hard frost in late fall. In states where winters are mild mini roses keep right on blooming, stopping only for a brief dormant period during the coldest month, or to re-grow after pruning.

Requirements for miniature roses are sun, well prepared soil with adequate organic matter, constant moisture, and limited root competition. If you know how to grow good hybrid tea roses you will have success with miniatures using the same techniques.

Miniatures have several advantages over larger rose bushes. Most importantly you can grow dozens of miniatures in the space required for 2 or 3 big hybrid teas. Miniature bushes require less water, spray material, fertilizer, pruning, and protection.

Design Ideas

Where do miniatures fit into the design of a little garden? Anywhere that you want a full season of color, so long as the basic requirements for sturdy growth are

Opposite:
'Green Ice', a good choice for hanging baskets because growth is bushy and spreading. Sink basket below frost in winter, then cover with salt hay, as was done with this with notably good results.

Right:
Here are two basic sizes of miniature rose: at left pink flowered 'Donna Faye', mature at 12 to 15 inches; at right a 5-inch micro-mini, 'Littlest Angel', in low bonsai pot.

available. Mini roses tolerate some dappled shade but do best with 5 or more hours of direct sun.

With this fact in mind plan for miniature roses to grow where sun will be unobstructed by tall shrubs and trees. Since these compact roses need less room than standard roses it is practical to build special beds for them, at minimum cost.

Raised Beds

One of my favorite ways to grow miniature roses is in beds raised a foot or more above the surrounding garden. A dual purpose raised bed can be fashioned where you want a garden wall. Construct an 18 to 24 inch wide wall of field stone or hollow cement blocks, leaving the center open right down into the wall foundation. Fill the hollow with a commercially prepared rose bush planting soil, or your own mixture of humus, perlite, vermiculite, coarse sphagnum peat and slow-release fertilizer. Plant micro mini roses in the wall, with a ground cover of Kenilworth-ivy (*Cymbalaria muralis*) to cascade over the sides.

Another raised planting design, much easier to construct, is a raised bed against a cement house or terrace foundation where you will need only 3 sides. If such a bed is planted in a south to southwest position you will have miniature roses earlier in the spring and later into the fall, thanks to the protection. Sunlight warms the wall and stones, thus creating a favor-

This raised bed for miniature roses was constructed with field stone on top of solid bedrock near a salt water cove in Westchester County, N.Y. Sempervivum fill the rock cracks and dwarf aquilegia grow as companion plants.

able microclimate for growth. In this situation you will have to water more often than in cooler beds.

The most adaptable sort of raised bed is one that can be constructed anywhere in the garden simply by placing redwood lumber, patio blocks, railroad ties, or field stone to create an area 12 or more inches above the garden level. I prefer to make a terraced planting with several levels within the basic raised bed. This plan looks graceful and permits staging of the roses according to height and color.

Raised beds are especially valuable in little gardens because by going UP where you can't go OUT you provide more growing space.

Soil Preparation

Prepare garden soil by mixing it with ⅓ to ½ parts by volume of coarse sphagnum peat moss. In clay soil areas sprinkle horticultural gypsum over the beds before digging. In all but very alkaline zones use dolomite limestone like a dusting of sugar, to modify the acid reaction from sphagnum peat. Miniature roses do best with a soil pH of 5.6 to 6.5. If your garden currently grows good roses you need not bother with a soil test. To double check the pH follow directions in one of the widely available home soil-testing kits.

Where soil is very alkaline the roses will grow best if confined to raised beds filled with especially prepared soil, containing lots of coarse sphagnum peat. To maintain a slightly acid balance in areas with alkaline hard water use an acid-balance fertilizer.

Soil Modification

In addition to the coarse peat moss consider adding perlite to improve heavy clay soil, and vermiculite to hold more moisture, especially in sandy soils. Rotted compost and humus from plant matter are useful for fertilizer and soil building characteristics.

To prepare a large planting area first dig up the soil, then add the peat moss plus any additional modifiers you choose. In my own southern New York garden I use sphagnum peat moss, gypsum (we have clay soil), dolomite limestone (the natural soil is acid), perlite (to loosen clay), and vermiculite (to hold moisture and fertilizer until roots need them).

A small quantity of soil is often easier to prepare in a big wheelbarrow or mixing pan so you can throughly mix all of the ingredients together without disturbing plants in the garden.

Planting

Miniature roses are usually sold as growing plants in full or partial leaf. Most mail order nurseries send roses in small plastic pots. The safest time to plant, where winters are cold, is in the early to mid-spring. Order miniature roses well in advance to obtain the hybrids you want. Some local garden centers offer a few varieties each spring but only the specialists provide a full selection of new hybrids.

Plant the bushes about 1 inch deeper than they were previously growing. Water the new bushes with a transplanting solution which is made from a root stimulating hormone (Transplantone, Ortho Up-Start, Superthrive, etc.) plus a weak fertilizer. Thoroughly soak the soil and roots after planting. Remember that peat moss and vermiculite hold a lot of water so each plant will require about 1 gallon of solution immediately after planting. If the weather is sunny water again in 2 days. Up to one third of the top growth must be pruned back if any roots were damaged in planting. When no roots are damaged, and the branches are unbroken, it is not necessary to prune back miniature roses, unless you want them smaller.

Mulching

Mulch all bushes after the transplanting solution has been applied. In *The Complete Book of Miniature Roses* (Hawthorn Books, 1977) I provide a thorough survey of mulch materials. Most popular are bark chips and salt hay. A mulch will protect the soil from drying out and stops the earth from splattering onto the plants during heavy rains.

Watering

Miniature roses need a constant supply of moisture. The bushes do poorly if they dry out at the roots. A long dry period, especially with newly planted bushes, will cause most roses to perish.

In a small garden you should have no problem providing enough water for all miniatures from a garden hose. If there is not at least 1 inch of rain every 5 to 7 days it's time to water. Use a soaking device on the hose or a multi-tipped hose for precise portable watering. For more permanent watering arrangements consider an underground system of plastic pipes with trickle hoses every few feet. This sort of system is a great convenience in dry regions such as the Southwest.

Fertilizer

Provide a balanced rose fertilizer to encourage new growth every spring. Several national brands are available at garden centers. If you live in a region with unusual soil conditions (i.e. very alkaline, or very sandy) consult a local county agricultural agent for detailed recommendations on fertilizers. Otherwise use a nationally sold brand such as Ortho, Peters or Hyponex.

One useful product that fertilizes and provides some protection from insects is Ortho Systemic Rose & Flower Care, a granular 8-12-4 fertilizer combined with 1% Di-Syston systemic insecticide. I use this on miniature roses with good results. Another practical way to provide all-season fertilizer is with a slow-release plant food. The slow-release fertilizers last 3 to 6 months. Some suitable formulas are Osmocote 14-14-14 and Precise Timed Release Rose Food 8-12-4.

Pruning

Prune bushes to keep them at a desired height, and to remove old or dead wood. Each time you pick a rose cut back to a full leaf or more. Every spring, just as buds swell, prune about 1/3rd of the growth from last season.

You can safely cut away up to 1/2 of the top growth if you want extra compact bushes. Use clean sharp pruning shears.

Patio tree roses with miniature hybrid grafts are good container plants. In cold areas sink container below frost and mulch with salt hay. In mild regions even container-grown miniature tree roses will provide flowers all year long. 'Magic Carrousel' is white with pink to red edging.

Problems

Miniature roses have few problems but those most likely to occur are black spot, mildew, and red spider mites. Treat these problems as you would similar threats to perfect larger roses. For fungus problems like black spot or mildew spray with Benlate and Phaltan, mixed 1½ teaspoons each per gallon of water and applied every 7 to 10 days.

If red spider mites or other pests become a problem add Isotox or Orthene insecticide to the fungicide spray but follow package directions carefully. If no fungus problems occur then use ONLY the Orthene to control pests. Spray when temperatures are below 85°F and when roses are cool, such as in early morning or late afternoon.

Selections

Following is a list of only a few of the most outstanding adaptable clones. Be sure to see specialists' catalogs each year for news on the most recently introduced miniatures.

Medium to Large Growing Miniatures (12 to 24 inches tall)

- 'Avandel', a double flower in unusual pink-apricot blend, fragrant.
- 'Baby Masquerade', a yellow, pink, and white blend, very sturdy.
- 'Bonny' is a new raspberry pink with perfect hybrid tea flower shape.
- 'Fashion Flame' has coral orange flowers, lovely tight form.
- 'Green Ice' opens white, turns pink, matures to light green.
- 'Magic Carrousel' is a classic vigorous hybrid tea-shaped white flower heavily marked with pink to red petal edges.
- 'Mimi' has double pink fragrant flowers, very long lasting.
- 'Sheri Anne' produces a super abundance of orange-pink flowers.
- 'White Gem' has heavy substanced double white flowers.

Micro Miniature Roses (6 to 8 inches tall)

- 'Cinderella' will produce clouds of white pink-blushed double flowers when small. Prune to keep compact.
- 'Little Linda' has hybrid tea-shaped lemon yellow flowers.
- 'Little Liza' is a single deep pink flower with mossy bud.
- 'Littlest Angel' has rich yellow double flowers on a tiny bush.
- 'Pearl Dawn' has 1/2 to 3/4 inch light pink double flowers.
- 'Si' is the smallest mini, with 1/4 inch buds, 1/2 inch light pink flowers.

Miniature Rose Trees

Miniature rose hybrids are also offered grafted on to taller growing roses, to produce trees. For very small designs choose the 8 inch tall trees. For larger landscapes I like the Patio Trees which have 24 inch stems. In very cold regions the miniature rose grafts will require extra protection during the winter.

Sources

Many general nursery catalogs list a few miniatures so check those you have. For the largest assortment of hybrids send for the catalogs of miniature rose specialists.

McDaniel's Miniature Roses
7523 Zemco St.
Lemon Grove, Ca. 92045

*Mini Roses
P.O. Box 4255 Sta. A
Dallas, Tx. 75208

Pixie Treasures (25¢ catalog)
4121 Prospect Ave.
Yorba Linda, Ca. 92686

*Sequoia Nursery
2519 E. Noble Ave.
Visalia, Ca. 93277

Miniature Plant Kingdom
4125 Harrison Grade Rd.
Sebastapol, Ca. 95472

*Nor'East Miniature Roses
58 Hammond St.
Rowley, Mass. 01969

Polk Miniature Roses
1200 Hill St.
Hannibal, Mo. 63401

Small World Miniature Roses
6383 E. Evans Creek Rd.
Rogue River, Or. 97537 ❧

* Denotes hybridizer of miniature roses. All catalogs are free except as indicated above.

Full Sized Roses in Small Sized Gardens

Some gardeners say that roses do not make beautiful bushes, and there is some truth in this. We are dazzled by the burst of perfect blooms in spring, forgetting the barren weeks ahead when both bush and climbing roses are for the most part out of bloom. And should the gardener fail to spray faithfully to control pests and diseases, let the plants go dry during summer heat, and neglect a feeding program to keep the plants growing, then what a sad sight a rose bush can be! But this weakness is overcome to a degree when roses are planted in beds.

Yet, in spite of their drawbacks, there is a place in all small gardens for roses. A small bed edged with low annuals such as sweet alyssum can be planted near a patio, along a path, in front of a low shrub border. Specimens of grandifloras such as 'Queen Elizabeth' make stunning accent plants at the rear of a perennial border. Floribunda varieties have innumerable landscape use anywhere a low flowering shrub is acceptable.

Climbing roses give the greatest show of bloom for the least effort. Although the once-blooming climbers are less popular than everblooming varieties, they should be considered for some special spot such as a lattice against the garage, archway over a path, or trained along a fence. In fact, these are ideal spots for all climbers.

It is true that climbers need to be disciplined for best results. One good housecleaning of old worn-out canes early in spring with a bit of tidying up and training of new canes after spring flowering should do the trick.

An old fashioned and still charming way to train climbers and floribundas. The informal cascades are a good foil for the severity of the picket fence.

Gottscho-Schleisner

Above and opposite: Gottscho-Schleisner

More rugged than given credit for, roses can be tucked in almost anywhere as long as the soil is uniformly moist and there is little root competition, as in the case of this dwarf variety.

Most gardeners overlook one superb way of training climbers—that is, as pillars bound to a 6- to 8-foot post. Place a pillar in any position where a floral exclamation point will have dramatic impact. You will be surprised how one climbing rose can add excitement to the landscape scene.

Where bush-type roses, notably hybrid teas and floribundas, are planted in small beds, pruning in spring, after removing dead wood, should be done so as to leave the plants more or less of the same height except that plants in the center of a wide bed may be a little higher. Prune grandifloras according to the vigor of the plant.

Planning the color arrangement of roses in beds calls for deciding on a color scheme. We know of one garden where a bed of hybrid teas, running alongside a patio, was selected so that the color of the roses matched the color of the cushions on the garden furniture.

One final consideration is the size of plant. Some varieties grow tall, upright, branching. Others are of modest size, well suited to smaller gardens. A list of such roses, as observed in the Brooklyn Botanic Garden's Cranford Rose Garden follows. ⁂

GOOD ROSES FOR SMALL GARDENS

Peter Malins

Hybrid Teas

1. 'Gail Borden'—orange yellow
2. 'King's Ransom'—deep yellow
3. 'Chicago Peace'—pink blend
4. 'Hallmark'—medium red
5. 'San Diego'—light yellow
6. 'Granada'—red blend
7. 'Dainty Bess'—light pink
8. 'Hocus Pocus'—orange red
9. 'Fragrant Cloud'—orange red
10. 'Royal Highness'—light pink
11. 'Tiffany'—deep pink
12. 'American Home'—deep red

Floribundas

1. 'Bahia'—orange blend
2. 'Europeana'—deep red
3. 'Golden Fleece'—medium yellow
4. 'City of Belfast'—orange red
5. 'Fusilier'—orange red
6. 'Rumba'—orange blend
7. 'Cathedral'—apricot blend
8. 'Saratoga'—white
9. 'Circus'—yellow blend
10. 'Glacier'—white
11. 'Bon-Bon'—pink blend
12. 'Spanish Sun'—deep yellow
13. 'Ivory Fashion'—white
14. 'Snow Fairy'—white
15. 'Faberge'—pink blend
16. 'Matador'—orange blend
17. 'The Fairy'—light pink
18. 'Evening Star'—white
19. 'Pink Rosette'—light pink
20. 'Irish Mist'—orange red
21. 'Summer Snow'—white
22. 'Picnic'—orange red

Polyanthas

1. 'Katharina Zeimet'—white
2. 'Ellen Poulsen'—medium pink
3. 'Carol Ann'—medium pink
4. 'Echo'—dark pink

Pillars

1. 'Dr. Eckener', Hybrid Rugosa—pink blend
2. 'Don Juan', Climber—dark red
3. 'Cadenza', Climber—dark red
4. 'Golden Shower', Climber—medium yellow
5. 'Coral Dawn', Climber—medium pink
6. 'Tropicana', Climber—orange red
7. 'Iceland Queen', Climber—medium white
8. 'Spartan', Climber—orange red

Shrub Roses

1. 'Robin Hood', Hybrid Moschata—cherry red
2. 'Sea Foam', Shrub—white

Condominium Gardens

Designing gardens for condominium homes has limitations, first in the regulations set by management for digging and planting around the grounds. Moreover, since space is so limited, the selection and arrangement of plants calls for using discretion. Only plants of small size are acceptable. And each one should have distinction in form, color of bloom and foliage, all-season beauty if possible, and adaptability to its location.

However, even with these limitations, one has an opportunity to pursue many avenues of expression, such as free use of plants grown in containers, vines and espaliers against walls, summer color from annuals, and the varied textures of dwarf evergreens and shrubs. All may be part of an intimate landscape integrated, perhaps, with an outdoor living area. ⁂

All photos: Paul Frese

Left: Full advantage is taken here of an above-grade front door to create a colorful garden. Masses of annuals make an interesting pattern between low evergreens. Above: Dwarf evergreens make an effective enclosure for this outdoor living room which is furnished with plants in decorative containers. Below: Annual flowers massed between low evergreens and shrubs provide all-summer color.

Even the small garden can have . . .

VEGETABLES

Paul F. Frese

Rare indeed is the small garden that does not have space for at least a few vegetables. If there is not room for a separate vegetable plot, then a few kinds will fit nicely into ornamental plantings.

Parsley and chives make neat, all-season edgings for a path or flower border. Staked tomatoes can be set toward the back of a bed of annuals and perennials and when the fruit turns red, will add their color to the whole scene. Patches of lettuce may be tucked into open spaces between clumps of bulbs or annuals in borders. By the time annuals need room to spread, the lettuce will have been harvested.

Eggplant, originally planted in Europe as an ornamental, keeps its foliage and posture all summer. This is true also of rhubarb, which is a perennial. Even though rhubarb needs elbow-room, one clump is exceedingly decorative all summer since it thrives on the feeding and watering tendered other garden plants.

Climbing roses supported on posts and arches lose some of their glamour in summer. It may not be the best horticultural practice, but they do make solid supports for climbing vegetables such as pole beans and cucumbers.

There is one strict rule to follow when you mix vegetables with ornamentals. Never use the potent systemic sprays applied to roses and garden flowers on vegetables.

Vegetable Culture

The basic rules for growing vegetables apply even to the tiniest plot. All strength for the plants comes first from the soil. Avoid, therefore, low spots having poor drainage and areas over hardpan and heavy clay, places where roots of trees and shrubs penetrate the soil, and poor thin ground over bedrock, fill and gravel.

Diminutive varieties are ideally suited to a vegetable garden in a limited area. With good planning, a wide selection can be squeezed into a relatively small plot.

Gottscho-Schleisner

Smaller plants requiring less space, new midget varieties especially bred for small areas and special methods of cultivation, such as training vines up fences, make vegetable gardening in very small areas a challenging possibility.

U.L.: All America Selection. F_1 cherry tomato 'Small Fry.' U.R.: 'Ichiban' oriental-style eggplant. Early maturity, but slow to develop seed. Grows up to 12″ long. Plant 36-40″ tall. L.L.: 'Sugar Bush' bush type watermelon. Not for container growing, but very restrained foliage. L.R.: 'Butterbush' butternut squash needs only a quarter the space of usual vining types.

UL: All-America selections; UR: Petoseed Co.; C: G. Taloumis; LL, LR: W. A. Burpee

Most soils can stand considerable improvement of structure through the addition of organic matter such as compost and animal manures. Peat moss is a fair substitute and may be the most convenient for city growers to obtain. Beyond this, vegetables require ample nutrients to produce an abundant crop because, almost without exception, they are heavy feeders. Most amateurs do not apply enough fertilizer in the beginning, and also fail to recognize the need for additional feeding as the season progresses. The easy-to-store water-soluble fertilizers may be the most practical kind for city growers to use.

Most vegetables, except perhaps leafy kinds such as lettuce, need full sun all day. Land sloping to the east, south or west is better than a north slope.

Getting the Most for Your Effort

There are numerous ways to get the largest yield from little space. One is to interplant quick-maturing crops such as lettuce and radishes in alternate rows with slow croppers like eggplant. Beyond this, late plantings in empty space will give an autumn harvest. Wherever possible, vining plants, including pole beans, cucumbers, squash and pumpkins, can be trained over trellis netting, which is available from seedsmen and garden centers. All types of tomatoes should be tied up on stakes to save space and also keep the fruit clean.

A number of vegetables do well in large planters, tubs or other containers. In all cases there must be drainage holes in the bottom, the soil mix needs to be enriched with long-lasting fertilizers, and during periods of no rain, watering may be a daily task.

The vegetables you select to grow should be the ones which will fill your personal needs. If you are a lettuce fan, then select the choicest kinds and make several sowings, for spring and autumn harvest, even starting plants early in a coldframe. There are today a couple dozen or more varieties of vegetables which have compact growth habit and thus fit nicely into small plots. The selection of compact vegetables will undoubtedly increase as plant breeders develop improved varieties.

Selected Varieties

Beet—'Little Egypt', 'Early Wonder' and 'Crosby Egyptian' develop early, leaving space for succession planting. Use thinnings for greens.

Cabbage—'Dwarf Morden', with 4-inch heads, is earliest of all.

Carrot—'Tiny Sweet', 'Baby-Finger Nantes' and 'Little Finger', all small, early maturing.

Cucumber—'Patio Pick' is typical of compact new kinds. This one is good for pickling, salads. 'Cherokee 7' makes a 3-foot vine and bears normal-size fruit. Also 'Bush Whopper'.

Sweet Corn—'Golden Miniature' is a vigorous, productive 3-foot plant.

Eggplant—'Morden Midget'. Early, small bushy plants.

Head Lettuce—'Tom Thumb', a miniature butterhead type. Most gardens would have space for a spring crop of 'Bibb', 'Buttercrunch' and 'Ruby'.

Parsley—All kinds.

Pumpkin—'Hybrid Spirit'. Matures early, has semi-bush plant habit.

Radishes—All kinds.

Squash, Summer—'Scallopini' is a dark green, bush-type plant. Matures in 50 days. 'St. Pat Scallop', 'Baby Crookneck', 'Baby Straightneck'.

Squash, Winter—'Golden Nugget'. 'Butterbush', a 'Butternut' type, has one-quarter the plant size of vining types. 'Table Ace', a hybrid bush acorn.

Tomato—Several small-fruited kinds are available: 'Pixie Hybrid', 'Tiny Tim', 'Patio', 'Small Fry', 'Sugar Lump', 'Presto'. 'Sweet 100' bears great clusters of inch-wide fruit, grows tall. All are best staked, or grown in large containers.

Watermelon—'Little Midget', 'Sugar Bush'. Fruits weigh about 6 pounds. Not adapted to growing in containers. ❧

A selection of . . .

SMALL OR EASILY CONTROLLED PLANTS FOR WARM CLIMATES

James J. Franklin

The garden may be used as a place for viewing, as an outdoor living area, or for the production of flowers and vegetables. Whatever the family requirements may be, our fast modern-day tempo makes an easily maintained garden necessary. The selection of plants that do not quickly outgrow their sites helps achieve our goal.

"Tailored" plants with character in growth habit and variety in leaf or flower color and texture are becoming increasingly available. The designer of the little garden can choose from a wide variety of dwarf shrubs, not to mention seasonal bedding plants. Certain medium-sized shrubs can be grown as small editions. Even some of the taller-growing shrubs can be kept to controllable size for many years, and a few such plants may be desirable in diminutive gardens for scale. This may require a combination of pruning operations, including both thinning-out and heading-back. Growth rates are normally faster in warm climates than in cool ones, but if only a few plants are grown, their occasional pruning should not be a major task.

The following lists for home landscape situations should serve as a guide for the selection of colorful plants which are easy to control by pruning, or which are naturally low growing. Somewhat extra attention is given to plants that have a pleasing tropical effect and look especially appropriate in gardens of the Deep South. Recommendations are made primarily for hardiness zones 8 and 9 (see inside back cover). *Nursery Source Guide* (BBG Handbook #83) contains descriptions of most of the woody plants appearing on the following lists. Please note the codes: *B*, bold foliage effect; *E*, evergreen or nearly so; *SH*, shade tolerant; *SP*, late winter or spring flowers; *SU*, summer flowers.

Colorful Small-to-Medium Shrubs

Glossy abelia *(A. x grandiflora)* and a dwarf edition, *A. g.* 'Nana'. E, SH, SU. Long flowering period.

Orange-eye butterfly-bush (*Buddleia davidii*). SU. Purple, pink or white flowers. Needs periodic pruning but is useful for scale and long bloom.

Buttonbush (*Cephalanthus occidentalis*). SU. Primarily for wet sites.

Flowering quince (*Chaenomeles speciosa*). SP. Flowers scarlet red, pink or white. Many cultivars.

Scotch broom (*Cytisus scoparius*). SP. Evergreen appearance.

Slender deutzia (*D. gracilis*). SP. White flowers.

Greenstem forsythia (*F. viridissima*) and others. SP.

House hydrangea (*H. macrophylla*). B, SH, SU.

Oak-leaved hydrangea (*H. quercifolia*). B, SH, SU.

Showy jasmine (*Jasminum floridum*). E. Semi-climber. Long flowering.

Dwarf selections of **crape-myrtle** (*Lagerstroemia indica*) such as the Crape-Myrtlette series in mixed colors. SU. Long bloom.

Common lantana (*L. camara*). E. Long flowering.

Trailing lantana (*L. montevidensis;* formerly *sellowiana*). E. Long flowering. Useful as a ground cover.

Variegated leucothoe (*L. fontanesiana* 'Girard's Rainbow'). E, SH, SP. Tricolored foliage. Needs acid soil.

Vicary golden privet *(Ligustrum x vicaryi*). Leaf color best in sun.

AN INVITATION TO JOIN AND ENJOY

> **A man does not plant a tree for himself;**
> **he plants it for posterity.**
> **—Alexander Smith**

ALL who read these lines and are interested in the out-of-doors and the beauty of living things are cordially invited to become Members of the Brooklyn Botanic Garden. The dues are $15 annually. Memberships make fine gifts, too. For many, the Botanic Garden means spiritual enrichment, and they find satisfaction in contributing toward its support. Others enjoy the Membership opportunities, which include a subscription to PLANTS & GARDENS, occasional plant and seed "dividends," popular short courses at reduced rates and other benefits. Why not get pleasure from both?

.... cut off here ....

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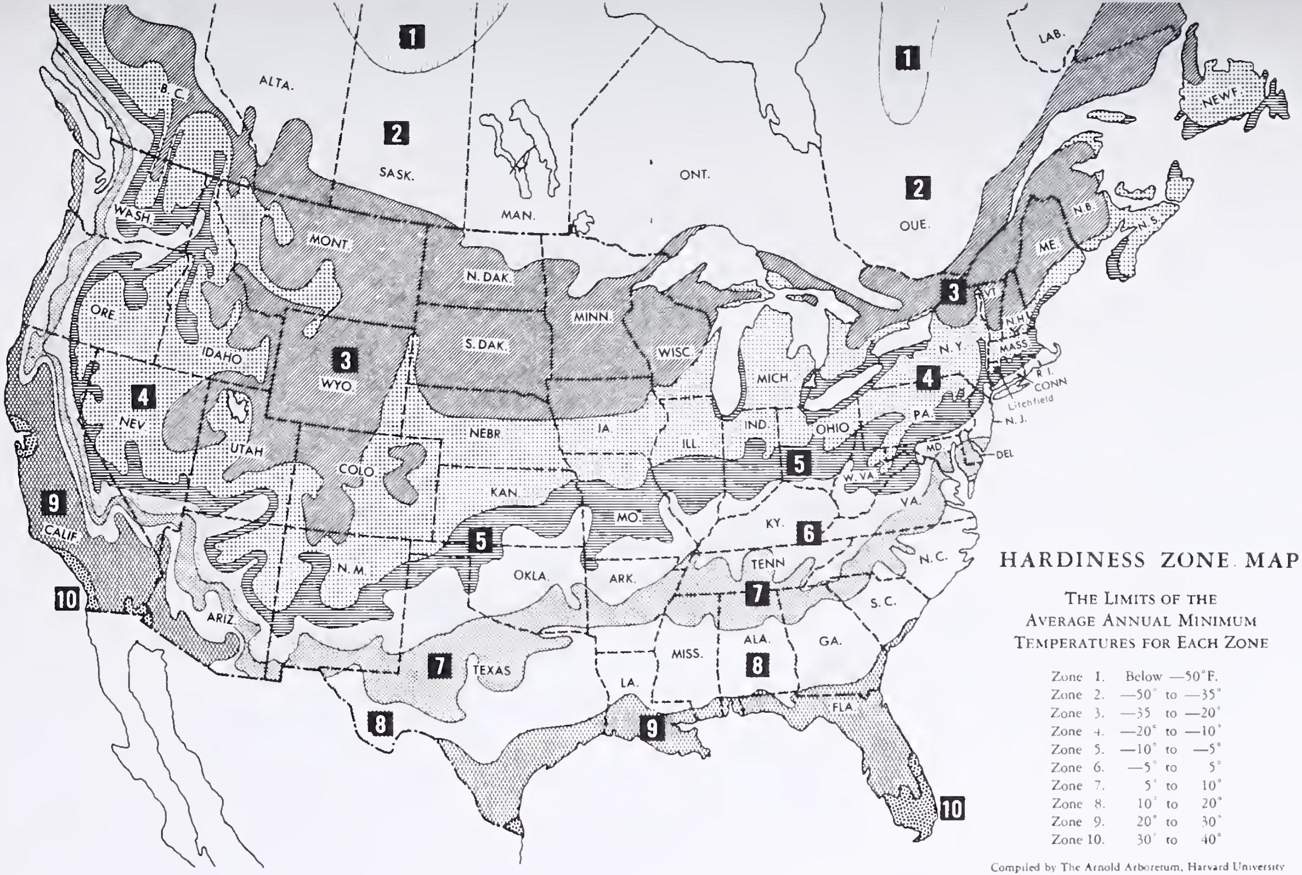

HARDINESS ZONE MAP

The Limits of the
Average Annual Minimum
Temperatures for Each Zone

Zone 1.	Below —50°F.
Zone 2.	—50° to —35°
Zone 3.	—35 to —20°
Zone 4.	—20° to —10°
Zone 5.	—10° to —5°
Zone 6.	—5° to 5°
Zone 7.	5° to 10°
Zone 8.	10° to 20°
Zone 9.	20° to 30°
Zone 10.	30° to 40°

Compiled by The Arnold Arboretum, Harvard University

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BROOKLYN BOTANIC GARDEN RECORD

PLANTS & GARDENS

Vol. 33 No. 4
(Winter, 1977-78)

THE YEAR'S HIGHLIGHTS IN GARDENING & HORTICULTURE

- Alternative to Lawns
- Maple Sugaring as a Hobby
- Tropical Rhododendrons

Also

- Chrysanthemum Bonsai
- A Review of Herbal History
- The Dodo *Was* Good for Something
- Recent Nontechnical Books and Articles

A class on weeds and annuals in the Children's Garden at Brooklyn Botanic Garden. (For more on this garden, see p. 40.)

BROOKLYN BOTANIC GARDEN RECORD

PLANTS & GARDENS

WINTER 1977-78

THE YEAR'S HIGHLIGHTS IN GARDENING & HORTICULTURE

Vol. 33 No. 4

Staff for this issue:
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MARGARET E.B. JOYNER, *Associate Editor*
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VIOLETTE CONNOLLY, *Secretary of Publications*
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AMONG OUR CONTRIBUTORS

George S. Avery, Quaker Hill, Connecticut, served as Director of the Brooklyn Botanic Garden from 1944 to 1969.

Warren P. Balgooyen, Naturalist, Teatown Lake Reservation of the Brooklyn Botanic Garden, Ossining, New York.

Gertrude B. Foster, Falls Village, Connecticut, is Editor of "The Herb Grower." Author, *Herbs for Every Garden* (E. P. Dutton Co., New York).

Joyce G. Greene is a high-school teacher of botany and biology in Colorado.

Thomas E. Hemmerly, Associate Professor of Biology, Middle Tennessee State University, Murfreesboro, Tennessee.

Richard J. Hopp, Professor Emeritus, Department of Plant and Soil Science, University of Vermont, Burlington, Vermont.

David G. Leach, North Madison, Ohio, is a well-known rhododendron grower. Author of *Rhododendrons of the World* (Charles Scribner's Sons, New York). Past President, American Horticultural Society.

Peggy Mobley, Riverdale, Georgia, has various horticultural interests outdoors and in the greenhouse. Member of the Georgia Chrysanthemum Society.

Robert D. Raabe, Professor of Plant Pathology, University of California, Berkeley, California.

Grace Rymer, Cleveland, Tennessee, is an artist and design consultant. She is a board member of the American Academy of Florists.

Robert W. Schery, Director, The Lawn Institute, Marysville, Ohio. Author of several books, including *Lawn Keeping* (Prentice-Hall, Englewood Cliffs, N.J.).

George Taloumis, Peabody, Massachusetts, is a well-known garden columnist, photographer and lecturer. His most recent book is *Winterize Your Yard and Garden* (Lippincott, New York). Guest Editor of the forthcoming Brooklyn Botanic Handbook on *Container Gardening.*

Stanley A. Temple teaches in the Department of Wildlife Biology at the University of Wisconsin, Madison, Wisconsin.

Mildred Thurman, Atlanta, Georgia, is a skilled home gardener and a member of the Georgia Chrysanthemum Society.

Elizabeth Remsen Van Brunt, Kitchawan, Ossining, New York. Honorary Curator of Herbs, Brooklyn Botanic Garden.

M. T. Vittum, Professor and Head of the Department of Seed and Vegetable Science, New York State Agricultural Experiment Station, Geneva, New York.

Donald Wyman, Weston, Massachusetts, is Horticulturist Emeritus of the Arnold Arboretum of Harvard University. Author of many books and articles. He has recently revised *Wyman's Gardening Encyclopedia* (Macmillan, New York).

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Letter From The Brooklyn Botanic Garden

As most readers know, the winter *Plants & Gardens* each year is the digest issue. It is essentially a selection of articles of more than passing interest which have appeared in other publications in the previous twelve months, with the addition of a few timely articles reaching print for the first time. To round out the issue there are a number of brief pieces based on horticultural news stories of the year, as well as notes on new books. Let us take this opportunity to warmly thank the contributors and fellow horticultural publications that have made possible this 132nd issue of *P & G.*

Many garden-related stories have been in the news lately. The vegetable and house plant booms seem to be leveling off as some easily discouraged new growers find cabbage worms on the cabbage and mealy bugs on the Maranta, but there are still a greater number of people growing these kinds of plants than ten years ago—and getting obvious pleasure in the process.

Greenhouse heating costs are ever on the rise, sparking considerable research in agricultural stations across the country on ways to whittle down fuel bills. Apart from work on solar units, one of the more imaginative approaches is that of Professor John Walker of the University of Kentucky, who has been experimenting with a greenhouse heated by an abandoned coal mine. Air from the mine shaft is warm in winter, cool in summer, and it contains an abundance of carbon dioxide which contributes to good plant growth. The problem of excessive humidity must still be resolved, but if a gardener happens to have an abandoned coal mine in his backyard, he should take heart!

Catalpas make the news about every 75 years whether they deserve to or not, so it is a pleasure to report a novel bigeneric hybrid between one of our native species and the desert-willow (*Chilopsis*), a common shrub of the American Southwest and Mexico. Robert Hebb of the Cary Arboretum, Millbrook, New York, found it growing this autumn in, of all places, a botanic garden in the Soviet Union, and brought plants home with him. We wonder if he has registered his very floriferous find with the recently formed Society for International Catalpa Culture (SICC for short), a wonderfully anonymous organization with no president, no dues and no address.

In a more serious vein, Estelle Gerard, who attends to publicity matters here at the Botanic Garden, has a request to pass along. If you see a mention of the Garden in your local newspaper, would you kindly take a moment to clip and send it to Ms. Gerard in care of BBG, 1000 Washington Ave., Brooklyn, NY 11225?

With spring a new horticultural year starts. May your own garden be bountiful and bring you a golden harvest of pleasure.

Sincerely,

Frederick McGourty, Jr.

Editor

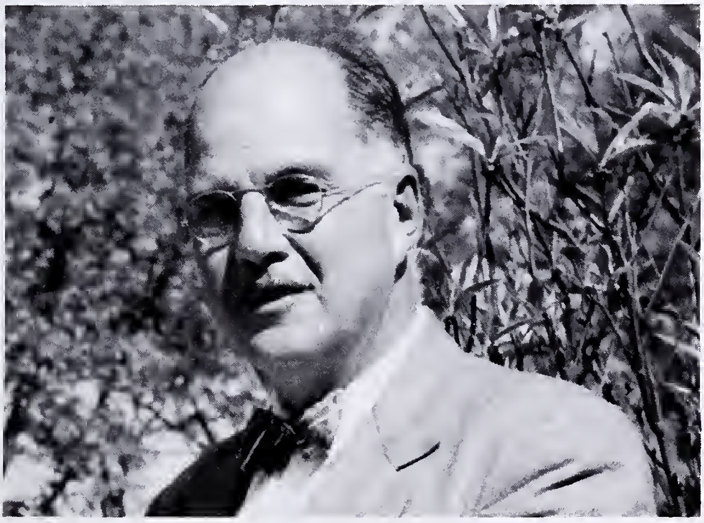
BROOKLYN BOTANIC GARDEN RECORD
PLANTS & GARDENS
WINTER 1977-78

INTERVIEW WITH DONALD WYMAN

It was a breezy late-September afternoon and the quiet drone of a distant lawn mower muffled the sound of falling leaves in the Boston suburb where Dr. Donald Wyman lives in retirement. Near the terrace of his garden apartment sedums and asters were in flower, nestled among broad-leaved evergreens and dwarf conifers, with an occasional astilbe and hosta for added foliage contrast. It was a tasteful, simple garden, the plants having been chosen for a long flowering period, for interesting leaf character, for seasonal yet year-round beauty. And, as Dr. Wyman was quick to point out, for low maintenance.

Gardens in some ways reflect the people who create them, and the Wyman garden is perhaps no exception. There is function, restraint, impeccable taste. The latest catalogue zinnias or effete rarities of the plant world won't be found here. The gardener has seen most of them, and he has made his selections based on a lifetime of growing and observing.

Until retirement in 1970, Dr. Wyman served for 35 years as Horticulturist at the Arnold Arboretum of Harvard University, Jamaica Plain, Massachusetts, and as one of the leading spokesmen for horticulture. In those years he helped influence the way many Americans look upon plants. Dr. Wyman is author of several standard reference works, including *Trees for American Gardens, Shrubs and Vines for American Gardens* and *Wyman's Gardening Encyclopedia*. Among his many awards are the Liberty Hyde Bailey Medal of the American Horticultural Society and the Veitch Memorial Medal of the Royal Horticultural Society of England. Here follows an interview with Donald Wyman.



When did your interest in plants begin?

Though born in California, I grew up in Philadelphia and attended Central High School. We had a botany teacher who had a way of sparking the interest of students. He asked me to make a collection of leaves, which I picked up along the Wissahickon Creek. Later he persuaded me to grow a few plants in pots at home. One of them was the spider plant, which I have grown mostly ever since because of that pleasant association.

Where did you go to college?

Penn State. Plant courses there were restricted to floriculture and pomology in those days, and I chose floriculture. Upon graduation I realized that a young fellow had to have a lot of money to buy a greenhouse range, so I decided to do graduate work at Cornell. I majored there in ornamental horticulture, plant propagation and plant physiology, all tied in with my main interest of growing woody plants, and I have stuck with that ever since. My master's thesis was on the use of electric hotbeds versus the old-fashioned manure hotbeds, my doctorate on how pin oaks responded to various types of cultural treatments. Professor Ralph Curtis, who taught plant materials, was the person at Cornell who influenced me most. I also taught for a while at Cornell.

Where did you go after Cornell?

Directly to the Arnold Arboretum of Harvard University where I thought I could learn the most about woody plants. Prof. Oakes Ames, the director, hired me that first summer without pay, which was all right because I needed the experience. That was in 1935. His successor, Dr. E. D. Merrill, appointed me Horticulturist, a novel title in those days, and, in fact, one suggested for me by Liberty Hyde Bailey. Now virtually every arboretum has a horticulturist, a sign perhaps that they recognize the landscape potentialities of plants.

What was the Arboretum like in the 1930's?

As in many other arboreta, the emphasis was on botany as such. My training had been with two land-grant colleges, where emphasis was placed on the practical and aesthetic use of plants—how to use them in the landscape, in the garden or in the home. The Arnold Arboretum had an extraordinary tree and shrub collection thanks to the efforts of C. S. Sargent and E. H. Wilson, and it had a healthy endowment for the study of plants, but no one on the staff seemed to be interested in what a particular plant would do for the average gardener.

Then what was your role?

My purpose was to take a special group of plants, for example maples, of which we had 137 kinds, and assess their potentials for use in landscape planting. These maples were unfamiliar to most people, and perhaps only a mere dozen of them were in the trade. One of my responsibilities was to study them for their ornamental potential—leaf character, autumn color, flower, fruit and other traits—and, eventually, select the best for ornamental purposes for use in American gardens and plantings.

How did you encourage nurseries to stock these trees?

The Arboretum began to distribute some of its better plants to nurserymen if they were not already in the trade. A nursery had to advertise nationally and promise neither to sell the original propagating material nor to patent it. From a list made up by me of a dozen kinds of plants each year a nursery could request us to send propagating materials of certain ones in which it was interested. About 30 or 40 leading nurseries cooperated in the program. I know it was successful because I made a study of what was in catalogues before and after our distributions. The paperbark maple (*Acer griseum), Malus* 'Dorothea', *Cytisus praecox, Hamamelis* 'Arnold Promise', and *Picea glauca* 'Conica' were only a few of the outstanding Arnold Arboretum introductions which made their way into home gardens as a result of the program. We were growing 7000 species and variants of ornamental woody plants. This program was the means of making the most outstanding plants available to the plant-buying public.

What experience in horticulture has given you the most pleasure?

I think the collecting of trees and shrubs from all over the north temperate zones of the world, and testing them together under similar conditions at the Arboretum, then selecting the best of them for ornamental purposes in America. The pleasure came in seeing our selections accepted by the nurserymen, landscape architects and the public in general.

Do you have a favorite tree or shrub?

The answer should be no in both cases, but a tree I like very much is a crab apple, *Malus* 'Dorothea', which I named for my oldest daughter. It is more ornamental than most other double-flowering crabs. The flower buds are deep pink and, as they open, they fade to pink and then to whitish-pink. The flowers are nearly 2½ inches across. The fruits are yellow, whereas those of most other crabs are red. They are also small, ⅜ths of an inch, and are not messy if the tree is planted along a sidewalk. The tree was selected as a chance seedling at the Arboretum in the 1940's. The tallest one we have now is only about 15 feet high.

Warminster broom (*Cytisus* x *praecox*) is a very attractive shrub, once rare but now well established in the trade as a result of the Arboretum's efforts. It has a light lemon-yellow flower color that we don't see much in woody plants of the North. The twigs present an evergreen appearance in winter.

Are you fond of certain evergreens?

Of course. Bear in mind that deciduous trees and shrubs are leafless for nearly half the year in the North. A few of them, such as sourwood (*Oxydendrum arboreum*), have a long period of effectiveness, but many deciduous plants can be monotonous in winter unless they are selected for twig character or branching habit. A favorite evergreen of mine is hemlock, either *Tsuga canadensis* or *T. caroliniana*. I once saw a hedge of Canada hemlock at the Dominion Arboretum and Botanic Gardens in Ottawa, Canada. The hedge was about 50 years old but kept to just 4 feet in height by intelligent pruning at the proper time. The soft foliage, graceful arching branches and fine pyramidal habit of these hemlocks make them, to my way of thinking, the best of all evergreens for ornamental purposes.

Are there trends developing in horticulture toward the use of certain kinds of plants?

Absolutely. Homes and grounds are smaller now. There is no reason why a person can't have just as much interest in growing small plants in a small garden as on a 50-acre estate. Our attention focuses naturally on smaller, insect-resistant trees; not immense elms but kinds of trees that grow to only 30 feet, and shrubs that may be only four feet tall at maturity. The same is true for shrubs. Grow lilacs if you will, but most of them eventually become large plants, and they have more than their share of troubles. Look for shrubs with four-season interest, such as many of the viburnums. In a small garden it is possible—and necessary—to be selective. There are hundreds of dwarf and slow-growing woody plants under four feet tall. It is these and many others only slightly taller that are ideally suited for the landscaping needs of today's small gardens.

What advice do you have for a young person going into horticulture?

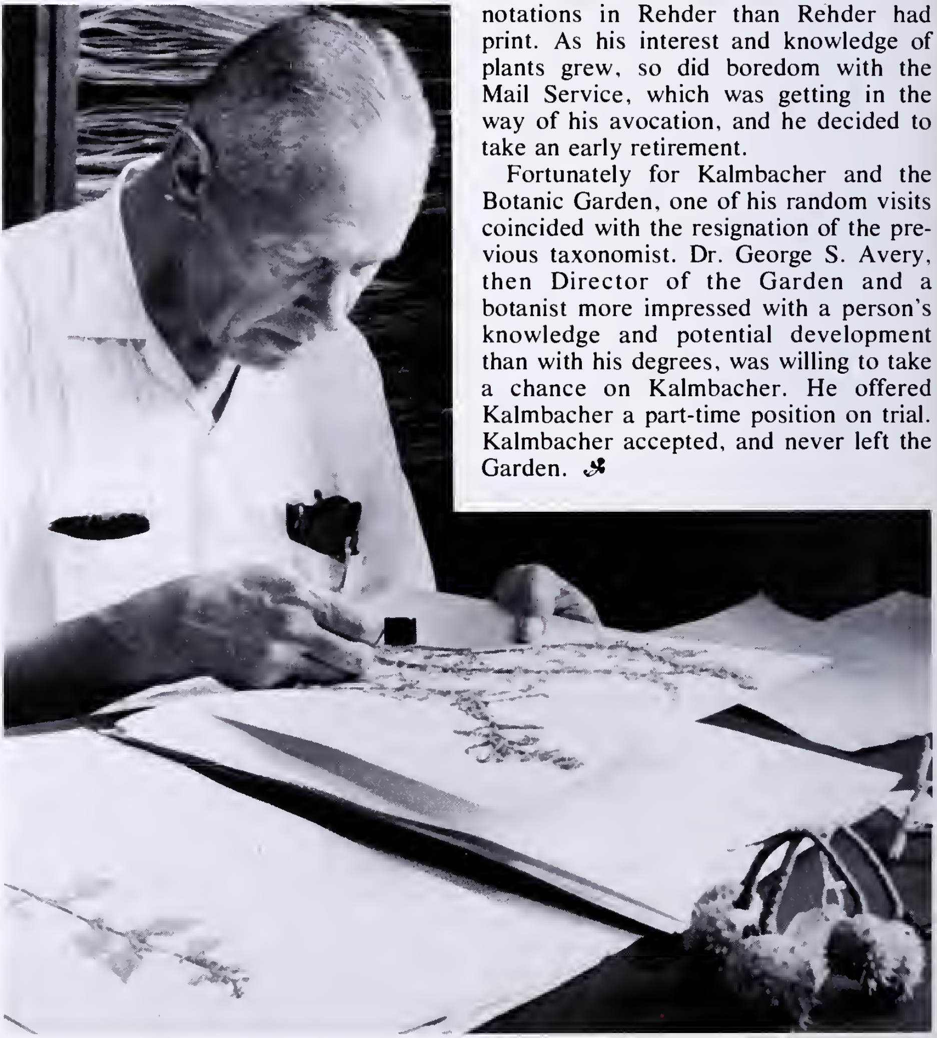
First, make a careful decision concerning the type of horticulture one really wants—floriculture, pomology, the growing of ornamental plants or landscape design. Then go to the best horticultural school possible, where training in your selected field is specialized. Competition in all phases of horticulture is stiff today, and the very best background one can obtain is essential. Finally try to obtain a position with a top-notch concern, even if the position is a lowly one, for there is no better way to learn than by working with the plants themselves. Once you are certain you like the field, and that you are with a good concern in which there will be opportunities opening up, stay with it and apply yourself to the utmost. ✤

A SELF-TAUGHT BOTANIST

We are sad to report the passing of George A. Kalmbacher on June 9, 1977, at the age of eighty. As Botanic Garden Taxonomist from 1955 to 1974, he was well known to readers through articles in *Plants & Gardens* and consultant work for various publishers. Mr. Kalmbacher was also a familiar figure in plant-specialist circles, especially the Cactus and Succulent Society and the Bromeliad Society, of which he once served as president.

Botanists of the older school often had diverse backgrounds, but even within this framework George Kalmbacher was unique. For thirty years he had worked as a mail handler for the Railway Mail Service. Vacation and leave time were spent travelling and learning about plants. Trotting around arboretums in distant towns, he carried a tattered copy of Alfred Rehder's *Manual of Cultivated Trees and Shrubs* and assiduously keyed every plant he could find. An insider's joke of the time was that Kalmbacher had more annotations in Rehder than Rehder had print. As his interest and knowledge of plants grew, so did boredom with the Mail Service, which was getting in the way of his avocation, and he decided to take an early retirement.

Fortunately for Kalmbacher and the Botanic Garden, one of his random visits coincided with the resignation of the previous taxonomist. Dr. George S. Avery, then Director of the Garden and a botanist more impressed with a person's knowledge and potential development than with his degrees, was willing to take a chance on Kalmbacher. He offered Kalmbacher a part-time position on trial. Kalmbacher accepted, and never left the Garden. ❧



From far-distant islands . . .

TROPICAL RHODODENDRONS FOR COOL ROOMS

David G. Leach

Reprinted from THE NEW YORK TIMES, December 11, 1977

A new race of tropical rhododendrons offers rich floral dividends for energy-saving greenhouse gardeners who keep temperatures cool. A minimum night temperature of 45 degrees is not out of line for these splendid plants. The vivid flowered shrubs from the Indo-Pacific add bold bursts of late fall and winter color with bonuses of bloom in other seasons, too.

The newcomers are the Malaysian rhododendrons. Most of them were discovered in New Guinea after the building of nearly 300 airfields on the island during World War II. The construction opened the previously inpenetrable jungle mountains to plant exploration. Ninety-six new species were first described only 16 years ago, a seemingly incredible development for a world usually thought to be thoroughly explored.

When several equatorial rhododendrons were first introduced from the Malay Archipelago into England in mid-nineteenth century, they were so unlike the species then grown outdoors that a reporter of the day implied they were not rhododendrons at all. A similar mistake could easily be made with the theatrically showy sorts recently discovered.

These startling plants are everblooming; they grow, flower, and grow once more to bloom again, throughout the year. While those with white flowers are usually strongly fragrant, the colored sorts are prismatically brilliant, with psychedelic combinations: orange and pink, for example, or crimson and yellow.

In sunlight, some of the blazing scarlets seem to glow with almost thermonuclear intensity. The largest flowers in the genus, giant trumpets nearly eight inches across, are borne by *R. leucogigas*. And the blooms are phenomenally durable. If they are not self-pollinated they will remain in good condition for three to four weeks, intensifying in color as they age.

There are about 300 species of Malaysian rhododendrons, with myriad varying characteristics. The alpines are often snug little mats of boxwood-like leaves which produce single drooping blood-red flowers held well above the foliage on slender stems. One species has leaves closely resembling the needles of a Japanese umbrella pine.

At intermediate elevations in New Guinea the strange Solenovireya rhododendrons are found. These have spidery clusters of flowers with thin, strawlike tubes ending in abruptly dilated minipetals. The tubes are often pink and the corollas white. Most gardeners would take them to be evergreen honeysuckles as they are similarly fragrant.

The most ornamental and the most easily grown species come from the lower elevations in the Indopacific. They rank among the most dramatically beautiful flowers on earth. These are not delicate, filigreed fancies; they are dashing splashes of color, florid and flamboyant.

Splendid Colors and Blooms

The most popular among hobbyists is probably *R. zoelleri,* a bravura performer with flowers the size of Dutch amaryllis in Halloween colors. Two especially fine cultivars are 'Golden Gate', deep yellow rimmed orange-red, and 'Island Sunset', with the shades more muted, eight five-inch flowers in a cluster. There is also a salmon-pink with a soft yellow center. All are fragrant.

Two other favorites, somewhat alike, are *R. laetum,* waxlike, with a silken sheen, and *R. aurigeranum,* the former a brash, scented yellow, and the latter with an added meld of orange producing a charismatic apricot, about 14 flowers each three inches across in a more formal truss. It seems especially free flowering and undemanding in the greenhouse.

Not quite so easygoing is the wonder of

The New York Times

Rhododendron aurigeranum has individual flowers up to 3 inches across in brilliant apricot with well defined stamens. If stamens are removed, flowers last for 3 weeks or more.

the Malaysians, *R. leucogigas*. The white flowers flushed pink are colossal stars with seven broad rays flaring from a slender tube. They often measure eight inches long and as much across, so strongly fragrant that a single open bloom will permeate a hobby greenhouse with a carnation-like scent. The leaves match the heroic proportions of the sumptuous flowers; they are tropically luxuriant, a foot long and five inches across. The seed pods are 10 inches in length.

Nurserymen have an inside joke that any nondescript rhododendron will sell to men, so long as it is approximately red. Among the Malaysians, *R. helwigii* is the blockbuster with patrician traits to boot. The thick-petaled, glowing crimson flowers, nearly four inches across in the best forms, appear as twins or triplets at the ends of the branches. Good alternates for those who like red shades are the vermilion *R. brookeanum* 'Titan', and *R. lochae,* which ranges from cherry-red to carmine.

The foregoing are among the tropicals which make the biggest floral extravaganzas, in yellow, orange, white and red, but there are many others, so varied in color, size, flower form and foliage that they may appeal even more to individual tastes. The amenable, floriferous *R. macgregoriae* produces big clusters of small flowers in countless pastel shades of pink, gold and copper.

Cultivation

Gardeners who grow the Malaysian species and hybrids must reject nearly every familiar principle of rhododendron cultivation. Temperate garden hybrids have fine roots and thrive in moist, humus-filled soil. The tropical rhododendrons have thickened roots which are moisture reservoirs. They require so little water that less than a gallon will sustain a plant in a six-inch pot for three months. In the Malaysian wilderness they are epiphytes, growing on tree limbs in hanging gardens intermixed with orchids and bilberries and their relatives. Moisture in the bit of jungle debris on the lofty perches evaporates quickly, so the plants have adapted to dryness which would quickly kill outdoor garden rhododendrons.

The equatorial species must be grown in the same media that are commonly used for aerial plants. So many different sorts succeed, from coarse fir bark to fern logs, that one of the bark and perlite mixtures prepackaged for orchids is probably the most convenient. Almost any acid medium that is loose, well aerated and with very quick drainage will do.

The most ornamental tropical rhododendrons tend to grow vertically, in an open, airy fashion dictated by the ancient search for light in the jungle treetops. They bloom most freely in containers which restrict their roots. After growing about 60 species and hybrids, I have found that even the most vigorous can be confined to six-inch pots for several years. There is a ready response to weak fertilizer and they can be pruned back as needed when their height requires it. (Most hobbyists are more interested in conserving space than in stimulating growth.)

In nature the equatorial rhododendrons grow in the same number of daylight hours the year around, and the difference between day and night temperatures is nearly constant at all seasons. Rainfall and the amount of sunlight appear to be the only factors that affect flowering.

In cultivation, whether outdoors in mild climates or under glass, there is a surge of bloom in late autumn and winter. In cold climates, the potted plants thrive far better in summer if they are removed from the greenhouse to a patio or plunged in a partly shaded bed outdoors after the last frost. The natural inclination to bloom toward the end of the year will be greatly enhanced by drying out the plants just to the point of wilting for two months as fall begins. Flower buds will be set much more freely. Then, when the plants are brought indoors to the greenhouse or to a window with good light, they will, after several weeks, start to stage their stunning performances.

Promoting Good Blooming

The blooming season can be manipulated almost at will by placing the plants under water stress. If flowers are wanted in midwinter, the dry period can be started later and the peak bloom will be correspondingly delayed. After a flush of growth, a second blooming period can be similarly induced, or the plants can be allowed to flower sporadically at random until autumn of the following year.

The Malaysian rhododendrons are essentially for frost-free climates outdoors. They thrive in southern California, Hawaii and from central Florida southward through the keys.

The tropical rhododendrons produce their threadlike, viscous pollen so freely that hobbyists often cut off the knob-like stigmas at the ends of the styles to prevent self-pollination, which shortens the extraordinary durability of the blooms. More casual growers should at least minimize self-pollination by placing the plants where they will not be jostled. The flowers will then be theirs to enjoy for the full three to four weeks which is often their duration in good condition.

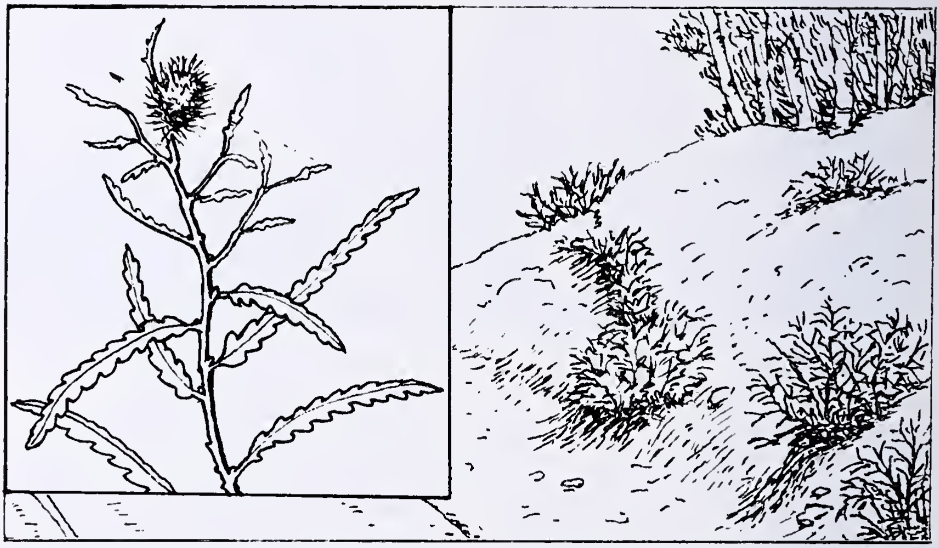
Some of the best Malaysians are available from Greer Gardens, 1280 Goodpasture Island Road, Eugene, Ore. 97401. Other sources are local nurseries which are building up stocks, but will not ship, such as the Berkeley Horticultural Nursery in Berkeley, Calif. The American Rhododendron Society operates a seed exchange for its members at 4609 Forest Avenue Southeast, Mercer Island, Wash. 98040. ☙

About Those Tempting Ads for Pecans

Pecans for the North? Well, sort of, as long as you don't stray too far from Colonel Sanders' country. A pet peeve of Richard A. Jaynes, plant breeder at the Connecticut Agricultural Experiment Station (New Haven), is mail-order nurseries that promote "hardy" northern pecans. Sure, there are mature pecan trees in the Northeast, including one at the Brooklyn Botanic Garden, but they very seldom produce filled nuts. The limiting factor, says Dr. Jaynes, is not cold winters or frost-free days so much as the lack of sufficient summer heat.

The Cooling Degree Days, which are determined from daily average temperatures above 65° F, are 584 in Hartford, 1,188 in Cincinnati and 1,420 in Kansas City. If the average is above 1,000 "CDD," pecans are worth a try; if not, grow another kind of nut tree. For a fuller account see Dr. Jaynes' article, "Northern Pecans are for the Midwest," in *67th Annual Report* of the Northern Nut Growers Association (copies available for $4.00 from R. A. Jaynes, Broken Arrow Rd., Hamden, CT 06518.) ☙

MACROBIOTIC COMPTONIA



Eva Melady

Macrobiotic is a word most people associate with hippies, health-food stores and Hare Krishna, but it had a definite meaning in the seed world long before the counter culture discovered yogurt. Specifically it refers to seeds with a long lifespan—more than 15 years. As tired tillers might expect, such garden scourges as pigweed, ragweed and knotweed are macrobiotic. One member of the Bean Family, the arctic lupine, is hyper super macrobiotic, with seeds germinating after an estimated 10,000 years in frozen Yukon soil, according to Canadian researchers (*Science*, Vol. 158, No. 3797: 113-114). Also, lotus seeds in the Orient were germinated after what is thought to have been 2,000 years in a peat bog.

Botanists have generally been guarded about claims of extraordinary seed longevity since the notorious mummy ripoff earlier in this century when there was a thriving but fraudulent market in viable wheat seed purportedly from the Royal Egyptian tombs.

Henry Compton, Bishop of London from 1675 to 1713, is, in a way, one of the latest to join the macrobiotic crowd. *Comptonia peregrina*, a graceful, aromatic, bank-cover shrub of the eastern United States which gardeners know as sweet-fern, is named for the good prelate. Peter Del Tredici, a Cabot Foundation (Harvard) researcher of forest succession, studied a northwestern Connecticut woodland that had been clear-cut to harvest a stand of 100-year-old white pine, then was bulldozed to encourage seed regeneration of the pine. To his surprise *Comptonia*, of which there were no parent plants near the site, began to sprout in abundance. Many years ago the woodland had been a field, presumably with *Comptonia*, a sun-loving species, growing in it.

In four years of work in New England Del Tredici had never seen seedling plants of *Comptonia*, since the species typically increases by root suckers. A chemical inhibitor localized in the hard outer covering of the seed makes germination difficult under natural conditions, but burial of the seed for many years apparently destroys the inhibitor. Then, if the soil is disturbed, bringing the seed to the surface, germination will occur.

For the full report see Del Tredici's article "The Buried Seeds of Comptonia Peregrina" in *Bulletin of the Torrey Botanical Club*, Vol. 104, No. 3: 270-275. For more on Compton see Jean O'Neill's "The Green-Fingered Bishop" in *Country Life*, Dec. 8, 1977. ❧

Update on Tree Blights

Three native northeast trees, the red pine (*Pinus resinosa*), hemlock (*Tsuga canadensis*) and beech (*Fagus grandifolia*), have all become hosts to scale insects, called such because of the virtually impenetrable covering which the adult female carries year round.

Most severe in terms of number of trees killed is the red pine blight. The red pine scale nymphs, hatched from eggs laid on the bark, migrate to a new location, sink in their mouthparts and feed on the tender inner bark and eventually kill the tree. Because the scale is so widespread, nearly all red pines in Westchester County, N.Y., and southwestern Connecticut are dead or dying. Cutting and burning all infested trees, a method used in New Jersey, appears to be the only relatively effective large scale method to curb the spread. Inoculating the ground with Temik, a highly toxic systemic insecticide that must be applied by a licensed specialist, is effective but expensive and not practical for large stands.

Discovered in Connecticut in 1946, the scale attacks red pines that have been planted, often by hydraulic companies near reservoirs, south of their natural range which extends down only to central Massachusetts. (The plantings are for erosion control and water retention.) What concerns experts is the spread of the scale northward to within only eighty miles from the native stands at this time.

Less devastating to its hosts is the hemlock scale, a species that begins its attack on the younger needles of the lower branches and works upward. By sucking the sap and causing defoliation of the tree, the scale is capable of killing its host. Although actual death from defoliation is not common, defoliation weakens the trees, making these more susceptible to other insects or pathogens. An infested tree has a foamy look about its needles. A close-up examination will show tiny insects shaped like rice grains firmly attached to the underside of the needles. Because of their armor the scale are vulnerable to sprays like Cygon 2E and Orthene only in mid-June and mid-September.

The third tree affected by scale insects, the native beech, is killed not by the insect, per se, but by the *Nectria* fungus that gains access to the inner bark through wounds caused by the scale. The tree dies or suffers severe damage from the reduction in food supplies caused by the fungus invading the inner bark and cambial zone and clogging the nutrient pathways.

Discovered in Nova Scotia at the turn of the century, the beech scale has invaded about fifty per cent of the area from Nova Scotia west to Wisconsin and south to Texas where the tree is native. Particularly severe infestations have occurred in Northern and Central New England; new outbreaks reported in New Jersey and Pennsylvania confirm that it has spread south and west from New York and Connecticut. Oil sprays are effective but prohibitively expensive on a large tract.

Pathologists and tree scientists believe that the ultimate control of scale insects will come from natural predators such as insects who prey on the adult and nymph scale and certain wasps that inject their eggs into the scale and the new wasp larvae subsequently devour the scale.

Because predator insects have been discovered, but do not exist at present in quantities great enough to curb the spread of scale, it is especially important to apply sprays only at the time when the scale is vulnerable. Improper or inadequate spraying can kill off the few known predators and leave the scale to flourish and spread even more. It is hoped that by identifying then breeding and releasing the predators in large quantities, the scale can be curbed and the trees left to recover or stands can be reestablished without the threat of reinfestation. ❧

Energy is required but more people are . . .

MAPLE SUGARING AS A HOBBY

Warren P. Balgooyen

It was the American Indian who discovered that the sap of the maple is sweet, and several tribes have legends about its discovery. Although there is some variation, a basic element of each legend is that a squaw used maple sap to cook with and discovered that the longer the food was boiled, the sweeter was the taste. A detailed legend of the Chippewa tribe says that a bowl used for gathering water was left on the ground beneath a maple. The tree had been wounded by a stone axe that was thrust into it for overnight keeping. Sap ran down the handle and dripped into the bowl. The next morning the squaw went out to gather water and found the bowl already full. This "water" was used and the discovery was made.

Indians worked hard for their maple sugar. They had no metal containers for boiling so had to use either birch bark containers over a carefully controlled fire or wooden vessels that they lined with red hot stones. The hot stones had to be constantly replaced as they cooled. When the weather was right some work was saved by allowing the sap to partly freeze. The ice was discarded and the remaining liquid containing the sugar, now in more concentrated form, was then boiled. This method was tried at Brooklyn Botanic Garden's Teatown Lake Reservation to confirm the Indian way.

The author bringing sap buckets to the sugar house. The structure, built of hand-hewn local materials, is at the Teatown Lake Reservation.

One cold day when the sap buckets were half frozen we carefully removed only the ice and melted it down. The ice water was then tested with a Baume sap hydrometer. While the usual ratio of sap to syrup is 40 to 1, our ice water measured 186 to 1. Clearly, it was not worth saving the ice! The remaining liquid was tested at the ratio of about 15 to 1. This method is only helpful when the temperature is below freezing. (On a small scale, the home freezer could be pressed into service.)

Maple sugaring has traditionally been an activity unique to the northeastern United States and Canada. It is not surprising that this region also happens to encompass a significant portion of the native range of the sugar maple.

Northern Europe has good concentrations of the Norway maple (*Acer platanoides*). Like the sugar maple, the sap of this tree has about 3% sugar. Sap volume and syrup quality also compare favorably. Producing sugar from the sap of trees is an American idea that never caught on in Europe. It might not even have occurred in America either had it not been for the resourceful Indian tribes of the northeastern United States and Canada who invented the process.

Another region where there is an "untapped" potential for the production of maple sugar is the American Midwest. The box-elder (*Acer negundo*), also a true maple, is common to the central and southcentral states, though native to other areas as well. This tree doesn't even look like a maple due to its compound leaf and its habit of forming thickets. Yet the sap is sweet and produces a fine syrup or sugar. Due to the tree's relatively modest size, sap of this maple is not easily gathered in sufficient quantity for any commercial exploitation, but the potential exists for the hobbyist who

Buckets on all but the south side of a sugar maple are less likely to become contaminated by bacteria.

All photos: Teatown Lake Reservation

A primitive but effective way of boiling down sap at Teatown.

would like to experience maple sugaring at home.

Commercially, sap is sometimes boiled under partial vacuum. This lowers the boiling temperature and speeds evaporation. New methods of sugaring are constantly being tried. Modern technology has brought us a long way from the primitive Indian methods. Even so, maple syrup and sugar remain high-energy, labor-intensive products. Because so much water must evaporate from the maple sap to produce just one gallon of syrup, hours of boiling are required. The maple industry, like so many other industries, is feeling the effects of today's higher cost of energy and labor. Most large producers switched years ago from the traditional wood fire to fossil fuels because of increasing labor costs in supplying wood. Now the higher cost of oil and other energy sources must be passed on to the consumer. If you can find a gallon of pure maple syrup that sells for less than $12.00 today you've got a bargain. Commercial producers can no longer compete economically with brand-name syrups, which are cheaper to produce and contain as little as 2% pure maple product. (Many of these brand-name syrups are artificially flavored and contain no maple at all.) Unfortunately, the American public accepts them, having never experienced the delicate and superior flavor of the real thing.

Many fear that pure maple syrup is on its way out. Although the commercial producer is finding it increasingly difficult to stay in business, the art of maple sugaring should be preserved, at least as a hobby.

The production of maple syrup whether by the barrel or by the pint takes lots of fuel. It costs about as much to produce a gallon on one's kitchen stove (for the electricity or gas required) as a gallon is worth on the market. But it is a hobby that keeps one busy outdoors at a time of the year when there is little else to do, and it is an activity that the entire family can perform together. The equipment required is simple and the initial investment is low.

Basic Equipment

A backyard sugaring operation would include: sap containers, brace and bit, sap spouts, a large pan to boil in, a heat source, a felt filter and a candy thermometer. Let us review the steps of sugaring and equipment required.

Trees. The sugar maple (*Acer saccharum*) is by far the best known source of sugar. Its range is from Canada south to the Carolinas along the Appalachians where the climate is cool. It is not found south of Maryland on the coastal plain and does not usually grow well in cities. Norway maples are widely planted on suburban and city streets. The red maple (*A. rubrum*) can be tapped if nothing else is available. However, the sugar content is low and about twice as much boiling is required to produce syrup. A few other trees can be tapped if maples are not at hand. The American Indian also employed the butternut (*Juglans cinerea*). At

Teatown we have experimented with butternut and are delighted with the results. The ratio of sap to syrup is better than with maple and the end product is as good or better than maple syrup. The excellent flavor is different, and not unlike the flavor of apple jelly. The syrup can even be processed into a fine jelly by extra boiling.

Tapping begins early in southern New England, southern New York, Pennsylvania and points south. Often the first buckets can be hung in mid-February, or about the time that the first red-wing blackbirds return from migration. To tap a tree, use a bit of about 7/16 inch diameter. Bore the hole at a slight upward angle about 2 or 2½ inches deep at convenient height from the ground. Oldtimers will tell you to tap the south side of a tree. The sun's warmth in cold weather stimulates sap flow on the south side earlier each day for the first week or two. This same warmth will also stimulate bacterial growth faster. However, these bacteria eventually clog the sap wood around the wound and decrease or shut off sap flow. For this reason we put out buckets on the north side of trees starting about mid-season. The cooler bark temperatures result in a later sap flow there. By April first it is all over in warmer southern areas. In colder regions mid-April is usually the extent of the season.

Spouts or spiles can be fashioned from wood or metal pipe or may be purchased. Commercial metal or plastic spouts work well because they are tapered for a tight fit and prevent sap loss due to leakage.

There are several dealers in maple equipment in the Northeast with mail order catalogues. They include:

G. H. Grimm Co., Inc.
Rutland, Vermont 05701

Leader Evaporator Co., Inc.
St. Albans, Vermont 05478

Soule Evaporator and Can Co.
Fairfield, Vermont 05455

If you are a nostalgia buff you can make your own wood spouts out of sumac or elderberry stems the way the settlers did. Cut a 6-inch section of about 1-inch diameter. Split down the center and remove pith leaving a groove for sap flow. Taper the end slightly with a penknife and remove the bark. For these wooden spouts it is important to select a bit size that is slightly smaller than the diameter of the spout; otherwise, leakage will occur.

Containers. Sap may be collected in any container that holds liquid, but a larger-volume one does not require as frequent collecting. Plastic jugs can be cut to fit over the spout in such a way that they effectively keep out the rain as well. However, a good tap produces 10 to 16 quarts in a day. Be sure that used containers are not contaminated in any way and were employed only for food storage previously. Standard sap buckets are available from suppliers in metal or plastic for about $2.50 apiece with covers. Plastic tubing may also be employed if your trees are on a hillside. Many large producers have switched to tubing as a labor-saver. This can be installed with a gravity drainage or by using vacuum pumps. Pumps will slightly increase sap yield but are costly. Tubing is not expensive and may also be purchased from maple suppliers. ⁂

Sweeter Maples—Someday

Saccharine may be in trouble, but the long-term prospect for sweeter sugar maples is good, thanks to the Ohio Agricultural Research and Development Center (Wooster), which has selected trees with twice the average sugar content. This means less boiling of the sap and saved energy costs. Seedlings will be distributed to maple syrup producers in the Buckeye State. Sour note: it will take about 30 years before these seedling trees are ready for sap production. Similar selection work has been done in Vermont. The patience of a Yankee is needed. ⁂

Plant-Animal Mutualism: Coevolution with Dodo Leads to Near Extinction of Plant . . .

THE LINGERING EFFECT OF THE DODO'S DEMISE

Stanley A. Temple

Adapted from SCIENCE, 197(4306):885-886 (August 26, 1977)

The two species in this example of obligatory mutualism are a now nearly extinct tree and the famous and long extinct Dodo.

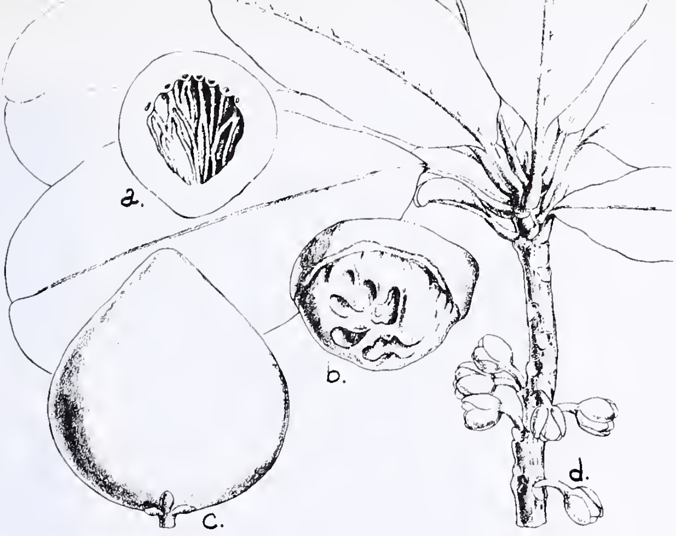
The tree is *Calvaria major*, a large species of the Sapodilla Family which grows on the Indian Ocean island of Mauritius. Once a common timber tree, by 1973 only thirteen over-mature and dying trees were known to survive in the remnant native forests of the 750 square mile island. Mauritian foresters estimate the age of each of these trees at more than 300 years. No younger specimens are known to exist despite the fact that the surviving trees produce well-formed, apparently fertile seeds each year. None of these now germinate naturally and if the total absence of young plants is a valid indication, there has been no germination of *Calvaria* seeds for hundreds of years. Even when planted under nursery conditions the seeds remain dormant.

The pulpy succulent fruit of *Calvaria* is about the size of a peach and bears a single seed which is completely enclosed in a stone or pit, the walls of which may be more than a half-inch thick. Apparently *Calvaria* seeds fail to germinate because the thick-walled pit mechanically resists the expansion of the embryo within.

Enter the Dodo

The most unusual of the original endemic birds was the Dodo, which became extinct by 1681, less than two centuries after it was discovered. The Dodo was a huge flightless bird related to the pigeons, but as large as a big turkey. Its strong beak, according to the reports of early explorers, indicates that it fed on fruits and seeds, especially seeds of palms and

Tenniel's dodo is anatomically correct with the exception of the gloves and cane; tea and cakes, rather than *Calvaria* pits, seem infinitely more to his taste.



Different parts of *Calvaria* shown ½ life size: a) cross section of seed showing thickness of the seed coat; b) seed; c) fruit; d) flowers (¼ size).

large forest-trees. The well-developed gizzard, containing large stones, would have enabled it to crush tough or hard foods, such as the pit of the *Calvaria*.

The temporal coincidence between the extinction of the Dodo and the last evidence of natural germination of *Calvaria* seeds 300 years ago has led me to hypothesize the following mutualistic relationship between *Calvaria* and the Dodo: The thick-walled pits could withstand ingestion by Dodos, but the seeds within were unable to germinate without first being scarified in the Dodo's gizzard.

Fossil *Calvaria* pits have been found among skeletal remains of Dodos in Mauritian marshland mud, which suggests that Dodos ate the fallen fruits. After the Dodo became extinct, no other animal on Mauritius was capable of ingesting the large pits, even though today the fleshy portion of *Calvaria* fruit is consumed by the endemic Mauritius parakeet and the flying fox. But unlike these smaller surviving animals that eat only the fleshy parts and leave the large pit untouched, the Dodo was large enough to have swallowed the entire fruit. Although there seem to be no recorded instances in which passage through an animal's gut is an absolute necessity for germination, in many cases germination rates are low without such treatment. Because *Calvaria major* has apparently been unable to reproduce for 300 years, the relationship between tree and bird may mark a scientific first.

If the *Calvaria*-Dodo co-evolution hypothesis is correct, *Calvaria* pits must have been able to withstand the crushing forces that were presumable generated by a Dodo's gizzard. Measurements of the gizzard force of grain eating birds are enormous, but if the Dodo had a gizzard-crushing capacity similar to that of a turkey, *Calvaria* pits would have been more than strong enough to withstand the forces in a Dodo's gizzard. I have estimated that a typical *Calvaria* pit somewhat more than an inch in diameter would need to be reduced in size by nearly 30 per cent before it could be crushed in a Dodo's gizzard. A bird this size would almost certainly have passed an object of this size or larger through its intestinal tract.

The most convincing evidence that seed-coat dormancy in *Calvaria* can be overcome naturally by passage through a bird's digestive tract comes from experiments in which I force-fed single *Calvaria* pits to turkeys. Some of these were retained in the turkey's digestive tract for as long as six days, and seven of 17 ingested pits were eventually crushed by the bird's gizzard. The remaining ten pits were either regurgitated or passed in the feces after being reduced in size through abrasion in the gizzard. I planted the ten recovered seeds under nursery conditions and three subsequently germinated. These may well have been the first *Calvaria* seeds to germinate in more than 300 years! ☙

A Lemon Substitute

Gardeners sometimes wonder what to do with the bitter, golfball-sized fruits of the trifoliate-orange (*Poncirus trifoliata*), the hardiest citrus and considered by many to be a distinctive ornamental shrub in gardens of the mid-Atlantic states. A marmalade, more or less, is made from them, but Botanic Garden member Carl Ferris Miller, who lives in Chollipo, Korea, suggests another use. The price of lemons there rose to 50¢ each, and Mr. Miller decided to rebel against inflation. He experimented with sections of the trifoliate-orange in his tea and reports that it is much tastier than lemon. Staff members tried his recommendation this past autumn—with fruits from a specimen growing in the Botanic Garden, and all agreed that the recommendation had merit! ☙

How Poisonous are Black Walnut Roots?

Walnut toxicity has fascinated gardeners since the time of Pliny. Little is known of how it works, apart from the fact that a substance in the roots of black walnut (*Juglans nigra*) called juglone can apparently kill tomatoes and certain other plants when grown nearby. Another group of plants seems to thrive. Juglone has also been isolated from the Persian walnut, butternut and shagbark hickory. L. H. MacDaniels and David L. Pinnow of Cornell University have provided an update on walnut toxicity for the *67th Annual Report* of the Northern Nut Growers Association. Among their findings:

Roots of the black walnut must be in contact with, or in very close proximity to, other plants to cause injury. For example, a tomato plant growing under a young walnut may be unharmed. However, roots beyond the crown of a *mature* walnut can kill; the area they occupy may be five or six times that of the tree's crown.

The application of nitrogen to injured plants can partly offset toxicity. Mulches composed of black walnut leaves, husks or bark are not harmful though they, too, contain juglone. However, a substance leached from walnut husks and poured on the soil can kill earthworms. About a year after a walnut is removed, the toxic substance disappears, presumably with the death of the roots.

Plants recorded as being harmed by walnut toxicity include alfalfa, tomatoes, potatoes, shrubby potentilla, blackberry, rhododendron, azalea, mountain-laurel and blueberry. Plants that seem to grow satisfactorily or with improved vigor include Kentucky bluegrass, timothy, red top, white clover, beets, snap beans, lima beans, onions, parsnips, sweet corn, black raspberry, grapes, daffodils, red-cedar and maples. These lists may be influenced in part by the normally more alkaline soil under black walnuts. The pH may be as much as 0.7 point higher than in soils beyond the roots. ☙

THE ALTERNATIVE TO LAWNS*

Robert W. Schery

A while back a developer from the Dayton area called me wanting to know where he might purchase seed of native prairie grasses (he seemed only vaguely aware that prairie also includes a wide assortment of odd-textured forbs). He wanted to establish "prairie" on a condominium development, the better to be in tune with the environment. The planting was to be left unmolested and self-sufficient, its rippling seed stalks of unmowed grasses a visual delight.

I indicated that yes, there are sources for prairie grasses (at least *Andropogon, Bouteloua, Buchlöe,* and a few others),—rather expensive, but available. But how did he propose to make his new prairie persist on Ohio cornbelt land? Competition from volunteer Kentucky bluegrass (*Poa pratensis*), tall fescue (*Festuca arundinacea*), and hordes of other adventive grasses and weeds would be inevitable. Even were he to sterilize the soil, pan-boreal and indigenous species better adapted to Ohio than prairie grasses would not long be denied! Most disruptive would be woody invaders, including brambles and various weed trees.

Would the developer burn the ground over periodically? Or would he have a gang with knapsack sprayers apply herbicides to each unwanted plant? Could he alter soil conditions, creating a drier habitat that might favor prairie? Grazing could be simulated by mowing, but then why not well-bred turfgrasses which have proved so much better adapted to this sort of thing? The point is obvious. Even were exact knowledge available about how to maintain prairie in southwestern Ohio, to establish and keep it would be more costly than would be a conventional lawn.

Back to Nature Isn't Easy

Because we live in a world almost totally altered by mankind's activities, so that today the "natural" state is the unnatural, this example shows that a return to the "natural," even if desirable, can be both difficult and expensive.

Despite the inherent problems, are we heading in this "natural" direction? Interest does seem shaping up. Fred McGourty writes, eloquently: "Now, my guess is that the next couple of years will see a rash of meadow-gardening articles in various magazines, with at least a hint of bias against lawns, and in the name of the environment. The subject has a great appeal for the growing number of 'natural' gardeners, mainly the almost-grown-up Pepsi generations who don't want to be tied down by the Draconian discipline of a detailed lawn-care program and who envision a pristine alpine meadow from Mount Rainier in their backyard—no doubt partly inspired by TV ads for Maidenform bras and certain brands of cigarettes!"

People react, understandably, to harsh urban settings with idyllic ideas. They forget that achieving the "balance of nature" takes eons, and that the process is not always pleasant. Far more time than a human life span encompasses is required and a lot of things can go wrong before climax is reached, if it is reached at all. Yet dreams are the stuff on which a rewarding life is made. Harmonious surroundings, of whatever sort, support a more fulfilling existence. However, discouragement is the tribute that fancy must pay to reality, if a prairie in the front yard is to be one's dream.

The Case For Lawns

My livelihood in recent years has depended upon lawns. I pretend to know how to make and maintain one†, so perhaps I am a bit biased. But I don't see "all the horror" in a modern lawn kept the modern way! Lawns are really quite

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*Stimulus for this piece is Arthur Ode's provocative article, "The American Lawn and Its Alternatives," PLANTS & GARDENS, Spring, 1977.

†See "Lawns & Their Tending," in Brooklyn Botanic Garden Handbook #79; also by the author, *Lawn Keeping,* Prentice Hall, 1976.

Both photos: The Lawn Institute

Three ecological areas, lawn, 'prairie' and woodland, as seen from the author's home.

efficient ground covers. Just as transportation evolved from the jogging ox cart to the automobile, so has care of the home grounds progressed from fertilization and mowing by livestock to a fairly simple, mechanized routine. The quality of a lawn today, judged as an elegant, weed-free monostand, was not even obtainable a few decades back; it awaited the evolution of advanced cultivars, capacious mowing equipment, automatic irrigation, precise pesticides, convenient sprayers and spreaders—and articulate information about lawn tending.

Having an acceptable lawn really requires little more than planting good grasses, fertilizing them occasionally (at the proper season) and mowing them considerately. Even though such a lawn competes well with weeds, occasional weed control is also generally required. If you mechanize with first-rate equipment, having a nice lawn is neither tedious nor unduly expensive. It can be as rewarding as any facet of gardening, and, looked upon philosophically, it provides a relaxing, healthful activity that provides many primary and secondary benefits.

A "Back-to-Nature" Experiment

These premises stated, let's examine a lawn alternative—in particular some twenty-odd acres of land let "go natural" during the last 23 years. An acre or two near my house is conventionally maintained as an average lawn might be, and will be our control for comparison. Acreage beyond this has been kept for a prairie-like view, unmowed but kept free of brush. Beyond the "prairie," woodland is allowed to regenerate as it will. My experience convinces me that maintaining the lawn is easier than attending the "prairie," although a little more costly of product and equipment. Untold man-hours have been spent trying to cope with Canada thistle, multiflora rose, hawthorn, bindweed and other aggressive plants on the unmowed grounds. The predominant grass on both mowed and unmowed areas is Kentucky bluegrass, although tall fescue, redtop and timothy give a good account of themselves where unmowed. Apart from grasses, the most

Conventionally tended bluegrass lawn near the house provides useful outdoor living space.

common plant is wild carrot (*Daucus*), with ample representation of other genera listed in the tables below.

The ebb and flow of vegetation on abandoned land varies with the season, the turn of the weather, and the climate. Where one lives will determine both seasonal and successional events and the flora and fauna one may enjoy or contend with. In most of the Northeast the succession progresses from annual weeds to perennial weeds to brambles and brush to intolerant (need sunlight) trees to, finally, tolerant forest. Stages along the way may prove unpalatable, and require even more drastic management than would regular tending of lawn. McGourty speaks of his rewards in the form of gentians, lady's tresses and other "specials" from an old meadow in Connecticut mowed twice yearly. But it also harbors some mammal pests (rabbits, woodchucks, mice), troublesome to the garden. And it is not without maintenance cost (mowings and special equipment for handling tall growth). Thus land abandoned from lawn keeping is not kept "for free," especially if chore-time is counted among the input costs. Direct energy expenditures are not likely to be so great as with a regularly tended lawn but, with a lawn, the energy consumed for gasoline, fertilizer, pesticides and equipment manufacture is not inordinate, and seems to be willingly endured for the sake of orderliness, even by those with only a modest income.

Kept "juvenile" by mowing and stimulated by fertilization, lawns are highly productive. In fact, in terms of energy measured by growth, and including the recycling of lawn clippings, slightly more so than native prairie. Thus having a lawn should not be considered any more wasteful than other amenities of a civilized way of life. In America, moreover, "Yankee ingenuity" has adopted lawn tending, mechanizing it, making it more convenient and moderate in cost than almost any other facet of gardening.

TABLE I SOME OF THE PLEASANT PLANTS VOLUNTEERING ON ABANDONED LAND (UNMOWED), CENTRAL OHIO.

Table I includes species that I am delighted to have—attractive, conducive to unobstructed view, not rampantly invasive of garden areas. These species are for the most part restrained by mowing in the formal lawn area and, should they wander, are generally controlled rather easily by phenoxy herbicides. Most are delightful in flower, especially chicory and daisy in early summer and ironweed, wild carrot, goldenrod and aster in late summer.

Wild aster, *Aster*
Bluegrass, *Poa*
Wild carrot, *Daucus*
Chicory, *Cichorium*
Cinquefoil, *Potentilla*
Daisy, *Chrysanthemum*
Dogbane, *Apocynum*
Shrub dogwoods, *Cornus*
Fleabane, *Erigeron*
Goldenrod, *Solidago*
Ironweed, *Vernonia*
Millefoil, *Achillea*
Mints, *Prunella* and others
Wild strawberry, *Fragaria*
Some thistles, *Cirsium*
Small grasses, various genera

TABLE II ATTRACTIVE BUT AGGRESSIVE PLANTS VOLUNTEERING ON ABANDONED LAND (UNMOWED) IN CENTRAL OHIO, TENDING TO BECOME PESTS.

Table II represents genera which are not unpleasant of themselves in the "prairie" community, but are over-aggressive in spreading to other parts of the property. Canada thistle and bindweed are legally noxious and hazards to agriculture. Wild grapes and Virginia creeper, themselves delightful vines, over-run and smother just about anything. Dandelion seed is a wide ranging threat, while young hawthorns and elms are irrepressible (and, unfortunately, very difficult to kill even with systemic herbicides).

Bindweed, *Convolvulus*
Canadia thistle, *Cirsium*
Dandelion, *Taraxacum*
Elm seedlings, *Ulmus*
Wild grape, *Vitis*
Hawthorn, *Crataegus*
Honeysuckle, *Lonicera*
Milkweed, *Asclepias*
Redtop, *Agrostis*
Teasel, *Dipsacus*
Timothy, *Phleum*
Virginia creeper, *Parthenocissus*

TABLE III NUISANCES, STRONGLY AGGRESSIVE, VOLUNTEERING ON ABANDONED LAND (UNMOWED) IN CENTRAL OHIO.

Table III encompasses the worst nuisances—those species which can be quite noxious, some of them legally so according to seed laws. (The brambles—blackcap raspberries and blackberries—are esteemed for their berries, but are listed here because of their rank, pervasive, clothes-rending habits.) All too familiar characteristics of the group are burs, toxic compounds, thorns and a tendency to squeeze other vegetation. Quick-starting trees obstruct the view, and impede succession to better, more tolerant species. Crabapple is an alternate host for cedar-apple rust (*Gymnosporangium*) which may afflict cultivated junipers. Quackgrass and tall fescue may become hosts for other inoculae which can spread to gardened areas.

Agrimony, *Agrimonia*
Brambles, *Rubus*
Burdock, *Arctium*
Giant Foxtail, *Setaria*
Multiflora rose, *Rosa*
Quackgrass, *Agropyron*
Poison Ivy, *Toxicodendron*
Sticktight, *Desmodium*
Tall fescue, *Festuca*
"Weed" trees (e.g. ash, cherry, cottonwood, crabapple, soft maple, mulberry, etc.), which shade out conifers and make a "tangle" difficult to penetrate.

Button Up Your Greenhouse

End-of-the-month apoplexy has afflicted many homeowners the last few winters as heating bills come in. If it has been an unusually cold January greenhouse owners in particular snarl at the postman more fiercely than Fido ever dreamed of, though there are as yet relatively few documented reports of actual bites of mail carriers by hothouse gardeners.

The bite is somewhere else. S. T. Jacobs, Sales Engineer of Lord & Burnham (Irvington-on-Hudson, N.Y. 10533), which has been making greenhouses for over 100 years, reports that it costs roughly $465 a year to heat a 12′ x 20′ home lean-to greenhouse with No. 2 oil in Connecticut these days. This is based on 65°F, with an 8-month heating season. That's not so bad compared with a Caribbean vacation or a jar of coffee, but it helps not to have around the heating bills from several years ago when paying the new ones.

The problem is most severe for commercial growers in the North, who may be on the endangered species list before long. This has stimulated considerable behind-the-stove research in horticultural centers. For example, W. L. Bauerle and T. H. Short of the Ohio Agricultural Research and Development Center suggest installing an air-inflated double layer of plastic (Monsanto "602") over the glass. It can cut fuel cost by 57%. (For details see Special Circular 101, available from OARDC, Wooster, Ohio 44691.)

Split-night temperatures in greenhouses are also promising, with work done at the Connecticut Agricultural Experiment Station, New Haven. The idea is to grow certain plants (chrysanthemums, lilies, some annuals) at 60° until 11 PM, then lower the temperature to 45° until 6 AM. Warm-watering (75°) follows. (For details see "Greenhouse Newsletter," May, 1977, Connecticut Extension Service, Storrs, 06268.) Further ideas to reduce heating costs are contained in "Grower Talks," October, 1977, (Geo. J. Ball, Inc., West Chicago, Ill. 60185) and in *Energy Conservation in Greenhouses* (Longwood Program, University of Delaware, Newark, Del. 19711).

Windbreaks also help conserve fuel in greenhouse or home. A brief report in *Crops and Soils Magazine,* October, 1977 (677 S. Segoe Rd., Madison, Wis. 53711) tells of a test with two identical homes in the air tunnel known as South Dakota. The heating bill for one of them was 40% lower because of surrounding trees. Tall shrubs and dense evergreens planted on the north, east and west sides of the house work best. For greatest benefit use trees growing 1-1½ times the height of the house. Distance from the house to the trees should be 4-6 times the windbreak height. ❧

Suffering Shortia

Are oak leaves themselves "acid?" Most gardeners vaguely seem to think so because a number of oak species grow naturally in soils with a low pH. However, Andre Viette of Fishersville, Virginia, a leading commercial grower of perennials and wildflowers, questions the conventional wisdom. One of his favorite plants is Oconee bells (*Shortia galacifolia*), a pretty little southern woodlander that requires a very acid, woodsy soil. It is found in only a few localities and is gradually disappearing from the wild. Viette believes the safest way to conserve a plant is to grow it in gardens, so he decided to propagate Oconee bells in numbers.

The original stock plants he obtained from North Carolina arrived in soil with a pH ranging from 4.2 to 4.7. To lower the pH of his own moderately acid nursery soil, he incorporated generous amounts of composted oak leaves (mostly red oak).

Viette's young plants of Oconee bells were languishing for no apparent reason. They had been given ample moisture yet good drainage, filtered shade and a humus-rich soil. On a hunch, he conducted a pH test on the oak leaf mold and learned to his surprise that the reaction was about neutral. The pH was corrected downward and the Oconee bells, along with partridge-berry, galax and wintergreen (other distinctly acid-soil plants), began to thrive again. Also, Viette advises that German peat as a rule has a lower pH than Canadian peat, which is usually in the 5-6 range. This too can mean the difference between success and failure with wildflowers that present their pH requirements in no-nonsense terms.

Anne H. Stronach

A VEST-POCKET PARK— LESS IS MORE

It was a hot July day in mid-Manhattan. Subways were microwave ovens, taxis screeched and horns blew as tempers flared. Human bodies resembled saturated sponges. Elevators droned like tired bees. The temperature was 104°. New Yorkers were convinced it was Celsius, not Fahrenheit.

Only mad dogs and plantsmen would choose such a day for garden-hopping, but a group of 25 eminently hot horticulturists descended on East 51st St. between Second and Third Avenues. The object of attention was Greenacre Park, an oasis privately owned and maintained by the Greenacre Foundation for the enjoyment of New Yorkers. Apart from sitting in an air-conditioned moviehouse showing a Charlie Chaplin triple feature, it was the one sane place to be in the baked 'Big Apple.' The temperature in the park was 75° and a 25-foot-high waterfall in the rear drowned out street folly.

Greenacre Park is not much larger than an Austro-Hungarian postage stamp. In fact, the park comprises only 6,360 square feet, but it has given pleasure and quiet restoration to millions of visitors since its founding in 1971 by the late Mrs. Jean Mauzé (Abby Rockefeller). Like its counterpart, Paley Park, on East 53rd St. between Fifth and Madison Avenues (see *Plants & Gardens*, Winter, 1968-69), the design is restfully simple with thornless honey locusts, a few dozen plants in containers which are changed frequently from early spring to late autumn to reflect the season, and 50-or-so seats. Architect: Hideo Sasaki, Watertown, Massachusetts. Coffee and sandwiches are available but not obtrusive. The park is clean and closely watched, and it is lighted in the evening during summer.

As our guide Barry Ferguson (responsible for maintenance of the plantings), explained, "It's a city park that works." ❧

Greenacre Park in mid-Manhattan, a city park that works. Containers are changed seasonally. English ivy (evergreen) and Boston ivy (fine autumn color) are interplanted on the masonry wall. The visual center of the park, the waterfall, provides another benefit—the virtual obliteration of city noises.

All photos: Johann D. Mayr

AN APPRECIATION OF THE OLD HERBALS

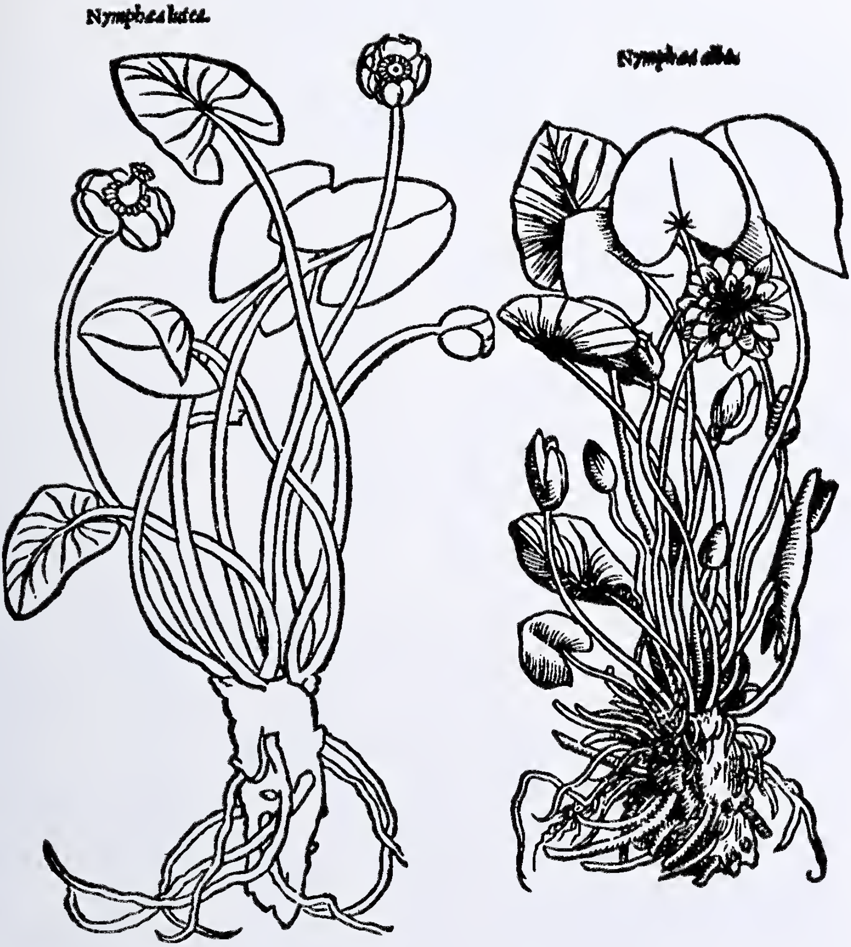
Elizabeth Remsen Van Brunt

Digests, computers, blenders—do they do too much of our thinking as well as physical labor for us these over-busy days? Would we enjoy a large, beautiful pink pill on our dinner plates more than a delicious meal artfully cooked, of course, with herbs? Time saved, yes, both in action and digestion. Perhaps some people enjoy digests of famous books; there are many such on the market quoting the old herbals.

A number of herbals, including some from antiquity, are in rare-book rooms of museums and libraries. The earliest may be looked at with reverence but in most cases are not readable, because we Americans are generally amateur herb lovers unable to cope with Greek, Latin, Arabic, Aztec or Saxon. Many of the earliest herbals have not been translated. Some have, and a few well known herbals from ancient, medieval and early modern times have been reprinted in recent years.

As if fed into a computer, much of the interest from the herbals has been incorporated into present-day books on herbs. These books are sometimes compiled by writers who seem to know little of gardening or botany, much less of herbs and their uses. In fairness to them, it should be said that the authors of early herbals, all of them copyists and pirates, did the

Medicine and herbs. The frontispiece to Lonitzer's *Kreuterbuch* clearly shows the importance of medicinal plants to the practice of medicine, or, as it was then termed, physics. The plants are seen about to be gathered from the garden, before which a group of physicians are shown in consultation. Immediately to the right of them an apothecary and his assistant are preparing and distilling herbs, while in the background a doctor administers them to his patient. (From *Kreuterbuch*, 1577.)


Nymphaea lutea.
Nymphaea alba.

Two nymphaeas. The nymphaea of Dioscorides is probably the European white waterlily (*Nymphaea alba*) rather than the closely related Egyptian lotus, which is not a true lotus at all despite its name. Besides prescribing it for ailments of the spleen and for dysentery, Dioscorides recommended that it be mixed with pitch so as to stop falling hair. It is certain that if the nymphaea failed, the pitch could be counted upon. (From Dioscorides' *De Materia Medica,* 1549.)

All illustrations and captions from An Illustrated History of the Herbals *by Frank J. Anderson. Captions courtesy of the author and Columbia University Press; illustrations courtesy of the New York Botanical Garden.*

same; they lifted bodily from previous manuscripts, woodcuts and illustrations as well as text. This was an S.O.P. (standard operating procedure) of the times.

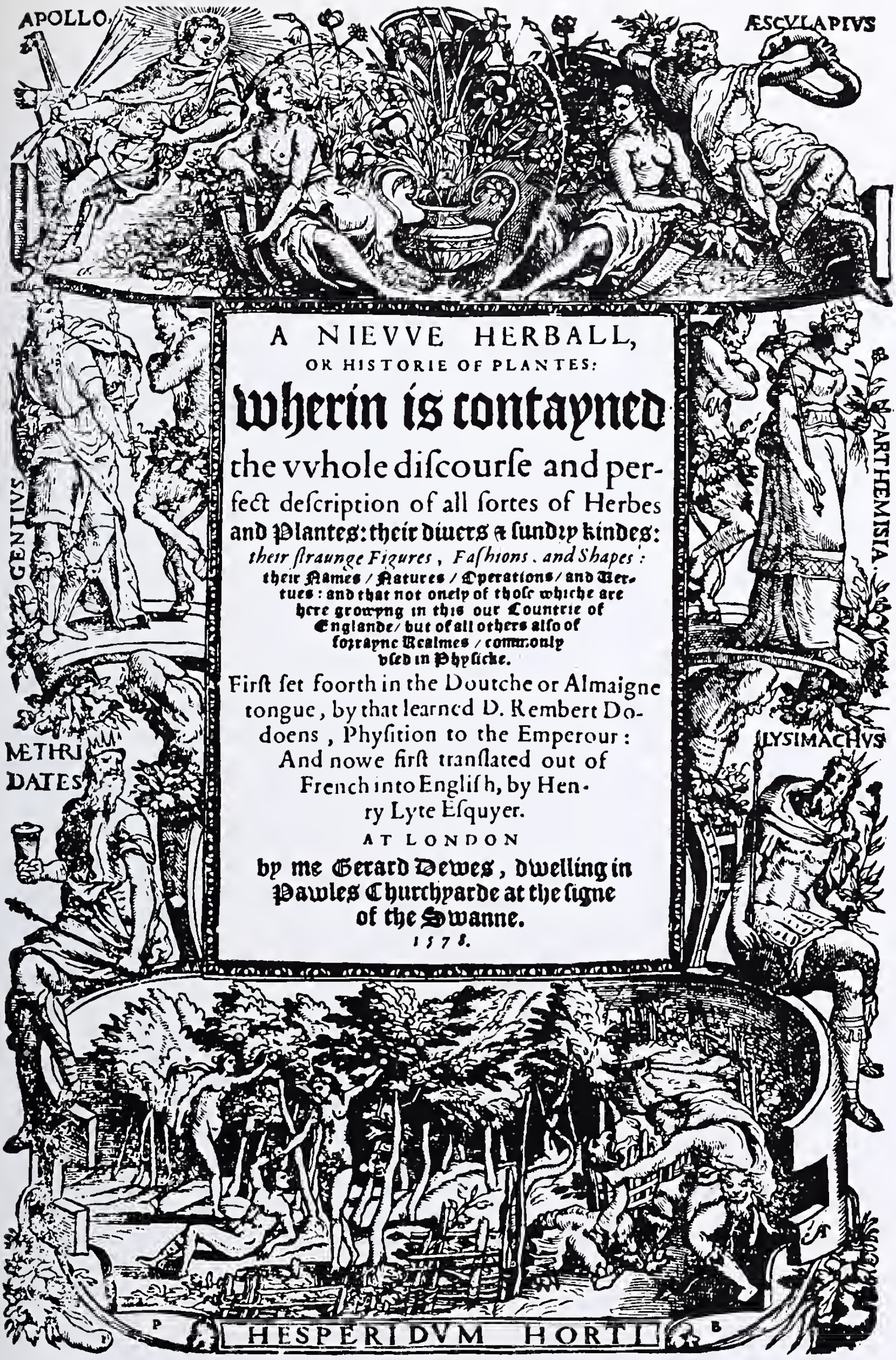
However, to read or study the earnestly composed botanical descriptions of plants, to learn of their usefulness and importance to mankind, makes one very conscious of the small part we have in the history of this world. We can realize that man since the beginning of time depended on the fruits of the earth for his existence, and for aid against the supernatural evil powers—the dragon, the worm, the fiendish elves of the marshes. Plants set upon the earth by a beneficent god could counteract all evil, whether eaten, applied or used medicinally and often accompanied by a repeated couplet, a charm if you will, or a blessing from a holy man.

Modern medicine has made strides undreamed of by our ancestors, but is there a learned physician who will deny that some illnesses have little-understood causes? A "virus," the doctor may say, perhaps to be alleviated by aspirin, rest and positive thinking. We may sense the wonder of past generations during such moments, and muse a bit about aspirin, a modern remedy now synthesized but occurring naturally in willows (*Salix*), which are plants of the marshes.

To me, the reading of the ancient beliefs found in the herbals brings a sense of appreciation of our world, something that is part of the history of mankind. These vivid descriptions of the uses of herbs are not in the digests. Leisurely writing is not for computers; facts are repeated but the colorful and personal note is lost. We must have leisure to peruse them.

Gervase Markham in his *Farewell to Husbandry,* written over three hundred years ago, gave advice for the month of December that we could follow all winter: "Lastly, for your health eat meats that are hot and nourishing, drink good wine that is heat, sprightly and lusty, keep thy body well clad and thy house warme, forsake whatever is flegmaticke and banish all care from thy heart, for no thing is more unwholesome than a troubled spirit."

The Astronomer. Striding his globes beneath a star-studded sky bounded on either side by the sun and moon, the astronomer holds the wind and catches the fire of the sun. The design, created by Hans von Weiditz, was used in a 1582 edition of Pliny, and captures the majesty of his opening book on the universe. (From Pliny's *Historia naturalis*.)


APOLLO
ÆSCVLAPIVS
GENTIVS
ARTHEMISIA
METHRIDATES
LYSIMACHVS
P
HESPERIDVM HORTI
B

A NIEVVE HERBALL,
OR HISTORIE OF PLANTES:
wherin is contayned
the vvhole diſcourſe and perfect
deſcription of all ſortes of Herbes
and Plantes: their diuers & ſundry kindes:
their ſtraunge Figures, Faſhions, and Shapes:
**their Names / Natures / Operations / and Vertues: and that not onely of thoſe whiche are
here growyng in this our Countrie of
Englande, but of all others alſo of
forrayne Realmes / commonly
vſed in Phyſicke.**
Firſt ſet foorth in the Doutche or Almaigne
tongue, by that learned D. Rembert Dodoens, Phyſition to the Emperour:
And nowe firſt tranſlated out of
French into Engliſh, by Henry Lyte Eſquyer.
AT LONDON
**by me Gerard Dewes, dwelling in
Pawles Churchyarde at the ſigne
of the Swanne.**
1578.

Title page of the 1578 edition of *Nievve Herball* is seen here with its elaborate border presenting a veritable medical pantheon.

Here is a very brief list of herbal reprints and several introductions to the herbals:

Culpeper, Nicholas. *Culpeper's Complete Herbal* (1653). Sterling Publishing Co., NY, 1959.

Dioscorides. *Greek Herbal (De Materia Medica,* Eng. trans. 1655). Hafner-Macmillan, NY, 1968.

Gerard, John. *The Herbal* (1633 edition). Dover Books, NY, 1975.

Grieve, M. *A Modern Herbal,* 2 vols. (1931). Dover Books, NY, 1971.

Parkinson, John. *A Garden of Pleasant Flowers: Paradisi in Sole Paradisus Terrestris* (1629). Dover Books, NY, 1976.

———. *Theatrum Botanicum* (1640), folio size in folder. Herb Grower Press, Falls Village, CT.

Pliny. *Natural History.* Loeb Classical Library, Cambridge, MA and London, 1938-62.

Strabo, Walafrid. *Hortulus: Facsimile of a Ninth-Century Manuscript.* Hunt Botanical Library, Pittsburgh, Facsimile Series No. 2, 1966.

For Background

Anderson, Frank J. *An Illustrated History of the Herbals.* Columbia University Press, NY, 1977.

Arber, Agnes. *Herbals, Their Origin and Evolution, 1470-1670,* 2nd ed., 1970. Hafner-Macmillan, NY.

Lawrence, George H. M. "Herbals, The End of an Era," *The Herbarist,* No. 35 (1969).

Rohde, Eleanour S. *Old English Herbals* (1922). Dover Books, NY. ☙

The People Who Wrote the Herbals

Who wrote the most influential early medical book? Dioscorides, a soldier from Cilicia, and the work was *De Materia Medica,* which became the ultimate authority for physicians for some 1,500 years. It was a herbal, based on the idea that plants can heal, and set the pattern for countless others, a few of which are still preserved in libraries. They are dim but invaluable reminders of how men thought of the natural and unnatural world around them.

Naturalis Historia, by Pliny, was another herbal of vast importance for hundreds of years. After Reason purportedly came of age, Pliny's work was eventually ridiculed for weaving fact and fiction. However, even today Jacques Cousteau has found that one of Pliny's fish tales, about dolphins herding smaller fish into the shallows to be trapped in nets by men, has some basis in fact. Pliny's life—and death—were associated with the sea, and he died on the beach, literally. As head of the Roman fleet at Misenum, he tried to evacuate the village of Stabiae during the eruption of Vesuvius that destroyed Pompeii. Fumes from the volcano did Pliny in before he could return to his vessel.

Herbalists were sometimes cantankerous. William Turner, author of the 16th-century *New Herball,* happened to be a religious Nonconformist in the age of Henry VIII, which led to his jailing and occasional exile in France. It didn't help that he had trained his dog especially to snatch bishops' hats. John Gerard, author, of sorts, of the *Herball* (1597), was the subject of two defamation suits. He cribbed unmercifully from other authors but gave their ideas literary style and elegance unknown in herbals up to that time.

John Parkinson, a druggist, was a punster. His title *Paradisi in Sole Paradisus Terrestris* (1629), translated into English, means park-in-sun's-earthly-paradise. It was more of a gardening work than was his medicinal herbal, *Theatrum Botanicum* (1640).

These and many other fascinating accounts of herbals and the people who wrote them are recorded in Frank J. Anderson's *An Illustrated History of the Herbals* (see page 61), a scholarly but fastmoving and sparkling book for herbivores and lovers of the classics. ☙

For a green surprise in Winter, try . . .

GROWING HERBS IN WATER

Gertrude B. Foster

Adapted from THE HERB GROWER, Winter 1976-77

A few years ago I was invited to speak to the Nashville, Tennessee, Centennial Club. My hostess, Betty Banks, gathered a bouquet of fresh herbs from greenhouse, coldframe and a green glass bottle on the windowsill in the kitchen for an arrangement to fit the topic. It was not surprising to find that she had lovely topiary rosemary in bloom in a deep coldframe, but the lush sprays of sweet basil growing in a bottle were quite astonishing.

The herb had been picked before frost and placed in the warmth of the kitchen. It was now March, when one would expect basil to begin to yellow and drop its leaves even if lifted as a potted plant from the garden. But the tall and aromatic wands growing with roots in water were green and lush.

Taking a lesson from Betty, I've rooted some other herbs more quickly in water than in sand and peat. The anise-scented and tarragon-flavored marigold, *Tagetes lucida,* a tender perennial, has been particularly successful. It tends to drop its leaves when taken as a cutting, dipped in Rootone and placed in sand. But in a bottle of unchlorinated water, it not only roots but begins to bloom in December in the house.

How to Root

If chemicals such as chlorine or fluorine have been added to the water supply, it is well to save rain water or melted snow for rooting herbs. Plants in water need only indirect light in mid-winter because they are not growing rapidly and sunlight shining on the bottle seems to promote the growth of algae. Green glass seems to speed rooting but it is said that all sorts of antique glass bottles and clear glass containers can be used. Most containers must be topped up daily as the plants begin to "drink" or the water evaporates in a heated house.

When roots have formed it is necessary to add some plant food. A water-soluble fertilizer, mixed ¼ strength of the directions given, can be added at each cleaning of the bottle or about once a month. One or two tablespoons of the weak prepared solution to a pint-size bottle is enough to sustain growth.

If you are planning to pot the rooted slips in soil substitute, remove them from the bottle when roots are an inch long. Keep roots moist whenever out of the bottle, for cleaning or potting. If the delicate hairs dry out, the plant will quickly die. A cutting rooted in water needs plenty of moisture when first transferred to soil, so keep the foliage from wilting by spraying with a fine mist for a week or so.

Other Herbs

Pineapple sage is a good subject for bottle

Eva Melady

growing. So are any of the mints and basils (if taken from green stems). Pinch out the two center leaves of each sprig to encourage side shoots.

Dittany of Crete was a great surprise in a trial of different herbs to grow in water. Its gray woolly leaves suggest that it needs very dry conditions, but in winter, when it would receive all the yearly rainfall on its native isle, it will spurt into growth. The slips with leaves removed below the water line will root very easily if the water is kept warm (that is, not allowed to become chilled, as on a cold windowsill).

The little-leaved Greek basil seems to be easiest to propagate in green glass but it needs to be cut back and renewed often because large plants become top-heavy. Pot marjoram and oregano will root in water if the slips selected have not become dark and woody.

Rooting herbs in water in the kitchen is not only fun, it assures a year-round supply of fresh herbs for cooking. It's also a good way to use the clippings from pot plants when they become leggy as the season progresses. In spring, pot up your bottle herbs and, when established, move them back outdoors. ❧

The Saint Who Watches Over Gardens

George Taloumis

Is there a patron saint of gardeners?

Pose the question to anyone, and most people, including gardeners, will reply: "St. Francis."

For his love and protection of birds, animals and flowers, St. Francis of Assisi has come to be regarded as the patron saint of all nature. And that includes gardeners, who often have a statue of him in their gardens.

The honor, however, belongs to St. Fiacre, an Irish nobleman of the 7th century, who with companions left his native land and wandered as far as Meaux, near Paris, where he began to preach Christianity to the heathen Gauls.

Approaching St. Faro, the Bishop of Meaux, Fiachra—to use his Celtic name—expressed his desire to settle in the forest and become an anchorite. The Bishop of Meaux offered him a tract of land, which St. Fiacre proceeded to clear. On it he built a monastery to the Virgin Mary, and added a room for himself and guests.

Not only did St. Fiacre till the land to grow vegetables, fruits and flowers, but he prayed, and soon became known for his life of sanctity. Pilgrims, as well as nearby nobles and peasants, came to him for comfort, healing and spiritual guidance. St. Fiacre fed them and often put them up for the night. Soon the holy hermit became known for his hospitality—and especially his ability to grow plants. As the numbers of visitors increased, he expanded, plowing and farming more land to produce more food for those who came to him in times of need.

At his death, the remains of this noble saint were buried at the Chapel at Meaux. In time he was forgotten.

Forgotten though he was locally, his fame had spread throughout France and Europe. In the 17th century, there came a rebirth, a revival. Travelers by the thousands went to Meaux to pay him homage, placing flowers at his burial chapel on August 30, the date of his birth.

To get to Meaux from Paris, travelers hired the hackney coaches of the day. Soon the coaches became known as "fiacres", and today the word "fiacre" in French means "cab" or "taxi". As a result, though not surprisingly, the cab drivers of Paris have adopted St. Fiacre as their patron, so he is shared by gardeners and taxi drivers alike.

Since the 17th century, on August 30, generations of pilgrims have poured into Meaux and to many other chapels throughout France that have been dedicated to St.

Fiacre bringing flowers to honor this beloved saint. They include gardeners and farmers, who have adopted St. Fiacre as their protector and guardian.

The memory of this saint, who loved to grow plants and befriend strangers, is also kept alive in parts of Scotland, according to the tradition that maintains that St. Fiacre was a Scot by birth.

Though figures of St. Fiacre have been depicted in several ways, he is always shown with a spade, the handiest and favorite tool of the gardener.

The version in the photograph is a copy of the 15th-century English statue in the Cloisters Gallery of the Metropolitan Museum of Art in New York City. St. Fiacre is shown with his traditional spade, yet his head bows over a book, another symbol of his work and the rich heritage he has left gardeners. ✤

Photo by Author

Autumn beauty with . . .

CHRYSANTHEMUM BONSAI

Peggy Mobley and Mildred Thurman

If you have wanted to train bonsai but hesitated upon learning that bonsai's aged appearance is the result of years of more-or-less constant attention, then chrysanthemum bonsai is for you. This special offshoot of the art of growing miniature trees permits one to complete a bonsai with a traditional look in less than one year. Also, the practical experience which may take several years to acquire if working with the usual bonsai subjects is accelerated into one growing season.

Don't be worried about making mistakes. The loss of a few plants will not be an economic disaster. And if you like plants, the chances are that you will succumb to the exotic charm of a well-formed chrysanthemum bonsai in bloom.

Steps to Chrysanthemum Bonsai

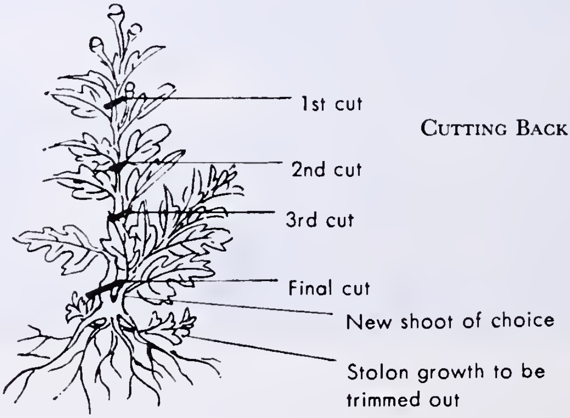
1. Selecting the Proper Cultivar: Not every kind of chrysanthemum is suited, so turn to the bonsai section of chrysanthemum catalogues for appropriate cultivars. (See list at end of this article.) Order early so rooted cuttings will reach you by late March. (In the South we are able to root short cuttings from available plants in February.) Cuttings can be rooted at any season if you have access to a greenhouse or to a window with full south exposure.

2. Planting the Rooted Cutting: We suggest a potting mix such as 5 parts leaf mold, 3 parts light clay soil, and 1 part sharp sand. The mix should have a slightly acid pH. Using a 3- or 4-inch clay pot, keep soil damp but not wet throughout this growing period.

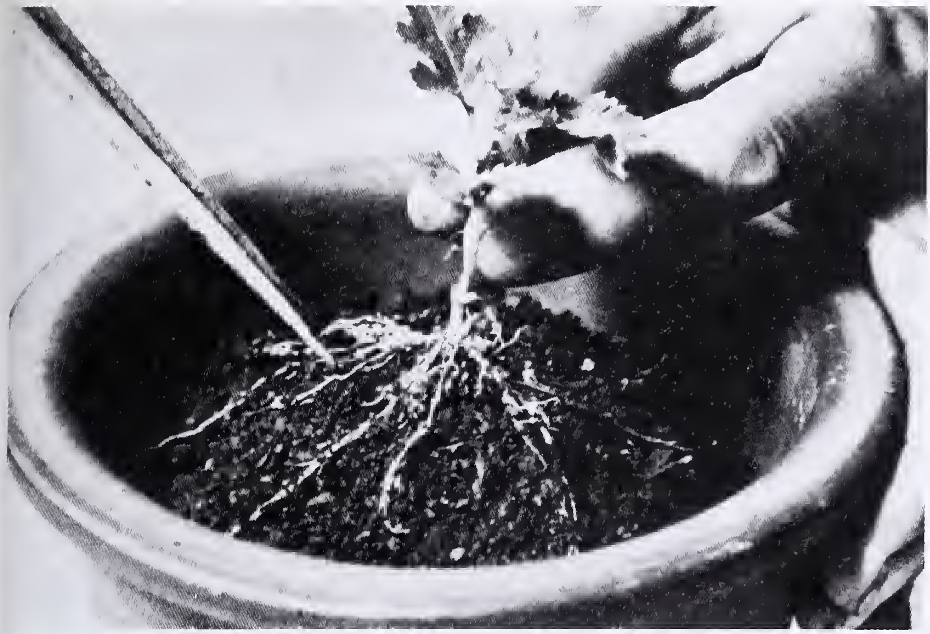
After a plant is well-rooted, and in an area sheltered from sun and wind, wash the soil from the roots of the cutting. Place the plant on top of the soil in the pot in which the chrysanthemum is to be trained. Its roots should radiate out from the stem and be covered with a light layer of soil mix. (If necessary, support plant with a small bamboo stick.) Follow this procedure for subsequent repottings. Subirrigate, *i.e.*, water pot from bottom, and shade plant for several days before placing in sun. Water when the soil appears dry and feed with a well-balanced fertilizer such as Osmocote 14-14-14. About a week after potting, pinch the soft growing tip of the plant.

Two or three weeks later new buds will emerge above the junction of trunk and roots, near ground level. In at least three stages cut back the central, original stem to its base, allowing time for the plant to recover between each shortening of the trunk. This is the key to the development of the bonsai-to-be. Next, select one new shoot to become the chrysanthemum's new trunk. The plant's original stem was woody and brittle, but the new shoot will be pliable and will thicken and taper easily. Remove stolons or runners so as not to sap the new trunk's growth.

3. Choosing the Bonsai Style: Keep your chrysanthemum in the small pot until a vigorous root system has developed, usually in a



Cutting Back Old Stem



Both pictures from The Art Of The Chrysanthemum

Spreading roots of the cutting radially over the mounded potting mixture.

month or so—this occurs by late April. By this time, if you planted in late winter, temperatures begin to rise and the plant will start active growth. Now choose the bonsai style that appeals to you. Keep in mind that a style encompasses the entire plant—trunk, branches, leaves, flowers, and partially exposed roots. Choose a bonsai style and stay with it; only by faithful adherence to a plan will bonsai succeed. If working with several plants and styles at once, label each pot.

Apart from the potting techniques which result in an unmounted style or a mounted style (unexposed or partially exposed roots), the training applied to the plant's other parts is virtually the same for all common styles. The following steps in growing and training a chrysanthemum bonsai are based on a calendar geared to November first, its natural blooming date in Atlanta. Most chrysanthemum cultivars are bloom-sensitive to the shorter days of autumn—they are "short-day" plants. (For those in northern climates where frost comes early, seek out a mum grower or other source of information about darkening plants before sunset, to give them shortened days and an earlier bloom date.)

4. Developing the Bonsai Style: Date: May 1. *Unmounted Styles*—Prepare to pot the chrysanthemum into a 6-inch work pot. Fill this larger pot to three-fourths with soil mix and spread the roots radially, covering with one inch of soil. Follow the same steps as for earlier potting, adding again a slow-release fertilizer.

Be concerned now with developing the character of the lower portion of the trunk. Begin bonsai training by attaching a #12 or #14 copper wire to the drainage hole and passing it up through the soil along the side of the plant's trunk. For the first two weeks the wire can be attached with a Twistem to the trunk merely as support for the newly transplanted chrysanthemum. Then wiring can commence. Plants tend to be more malleable when the soil is somewhat dry, so wire just before watering.

Depending on the bonsai style you have chosen, hold the plant firmly in one hand and, with the other, wind the wire snugly in fairly close spirals around the lower 3 or 4 inches of trunk. To lean to the left, spiral the wire counterclockwise and twist the plant and the wire to bend gradually to the left into the desired shape. Reverse for a bend to the right. Check wiring weekly and, if the wire is cutting into the stem at any time, remove it with wire cutters and start anew.

Pinch off the soft tip of the chrysanthemum to encourage growth of lateral shoots at each leaf axil. Return the plant to full sun for six weeks.

Mounted Styles: Remove plant from the orig-

Elizabeth Scholtz

In October and November many public Japanese gardens have chrysanthemum exhibits such as this.

inal 3-inch pot, shake it gently in a pail of water to remove soil, and drape roots radially over an inverted 3-inch pot. This pot should, in turn, be inverted over two or more inverted 3-inch pots and buried in the soil of a 6-inch pot so that the narrow end of the top pot on which the roots rest is even with the soil level. Cover roots with an inch of moist soil. Follow directions as given in previous section.

Developing the First Main Branch

Date: Approximately June 8. *Unmounted Styles:* Choose a vigorous lateral branch, one that is well above the junction of the trunk and roots, about one-third up the *final* trunk. Whether you select a branch going to the right or left is determined by the bonsai style you are imitating. Using copper wire #18, wire the branch accordingly. (By changing the angle of this lower branch a semi-cascade, cascade or upright bonsai can be developed.)

Remove all laterals below this branch. Keep one lateral, which at this time may be no more than a nubbin, above the branch as the new continuation of the main trunk. The sun will soon pull this new trunk section into an upright position. Cut off all growth above this branch. As this grows it must be wired to continue the design of the trunk. Keep plant in the sun for the next month.

Mounted Styles: Remove plant from its 6-inch pot, keeping root ball intact. The chrysanthemum and series of inverted pots should come out together, held fast by the webbing of roots. Add 2-3 inches of fresh soil to the bottom of the 6-inch pot. Replant root ball as before. The roots should be raised 2-3 inches above rim of pot. Subirrigate. Rain and watering will wash the soil from partially exposed roots and weaker roots will be eliminated. After shading, proceed with directions for developing the first branch and the new continuation of the main trunk as outlined under unmounted styles.

Date: Approximately July 8. *Unmounted Styles:* Many lateral shoots are growing from the new trunk continuation. The plant is also potbound. Remove one-third of the root ball, then replant in same pot, adding fresh soil.

At this time choose the plant's second principal branch, a strong-growing shoot 1-1½ inches above the first branch. Wire it as you did the first. Select the next strong lateral shoot above this as a new continuation for the bonsai's main trunk. Remove growth above it.

Remove large leaves as they appear on the first branch because they shade the developing branches and cause them to elongate. Leaf pruning also slows down vegetative growth. The sun can now penetrate to thicken and harden the branches and trunk.

Mounted Styles: After the first repotting, plan to report at four-week intervals. Add 2-3 inches of fresh soil at each repotting until the desired height of your particular mount choice is reached. As soon as the bonsai's roots have sufficient length to accommodate the mount, tip out the plant from the pot. Carefully, putting your fingers up through the root ball, remove all the inverted pots. In their place insert the desired mount (rock or perhaps driftwood) and repot in same 6-inch pot. Refill with fresh soil as needed. A week later, as with unmounted style, select the bonsai's second branch.

Date: Approximately August 1. *Unmounted and Mounted Styles:* New growth is well established. Now choose the third main branch. Wire it as you did the first and second ones. The next strong lateral above will be used as the continuation of the trunk and be allowed to develop into the "apex" or upper third portion of the bonsai. These laterals develop into branches which are spaced closer together. As in trees found in nature, the branches appear to be reaching for the sun. Remove all large leaves.

Water only enough to prevent leaves from wilting and fertilize only enough to keep leaves from yellowing. These two procedures inhibit new growth and keep developing flower stems short, a characteristic of a well-grown chrysanthemum bonsai.

Date: August 20-September 1. *Both Styles:* Pinch terminal shoots to balance the appearance of the plant. Spray the entire bonsai with a solution of B-9, a growth retardant which helps achieve a more compact plant. Now place the chrysanthemum in full sun to inhibit elongation of stems. Keep it relatively dry. Toward the end of this period flower buds will develop, so new growth can no longer be cut back. The bonsai's form is complete.

Date: September 1-15. *Both Styles:* Flower buds are visible. It is undesirable for a chrysanthemum bonsai to have an overabundance of blooms, because the beauty of a bonsai lies in its form. One should be able to view the trunk and branches through the foliage and flowers. When the buds in the terminal clusters are well formed, remove all buds except for one in each cluster. Flowers should give the impression of dignity and be spaced over the entire plant. At the time of disbudding, spray again with B-9 to insure that the buds will bloom on short stems, presenting the preferred appearance of flowers sitting gracefully on the foliage. Blooms drooping on long pedicels detract from the bonsai's charm.

Date: October 1-8. *Both Styles:* About this time, before the buds show color, transfer the bonsai to a decorative container. Remember to harmonize the shape and color of the "show pot" with the bonsai's style.

To fit an unmounted bonsai into the display pot, cut away as much of the root system as necessary. Cover the soil surface with fine moss. This velvet carpet should be worked under the exposed roots to cover most of the surface. Remove all training wire before displaying the bonsai.

Date: November 1. *Both Styles:* Now, just brief months after you began creating the bonsai, you can enjoy your flowering miniature chrysanthemum tree. The bloom period lasts four to six weeks and the plant can be displayed indoors during this period.

In your imagination escape into the enchantment that exists in these diminutive chrysanthemum trees. For a few minutes walls vanish; the mound of moss becomes a green meadow; the rock is a mountainside. This is the magic of your chrysanthemum bonsai. A magic that you created.

Sources For Chrysanthemum Cuttings Suitable For Bonsai

King's Chrysanthemums, 3723 E. Castro Valley Blvd., Castro Valley, California 94546.

Sunnyslope Gardens, 8638 Huntington Dr., San Gabriel, California 91775.

Further Reading

Advanced Growers Handbook, National Chrysanthemum Society, Inc., U.S.A. B. L. Markham, 2612 Beverly Blvd. SW, Roanoke, Virginia 24015.

The Art Of The Chrysanthemum, Tameji Nakajima and H. Carl Young. Harper & Row, New York, 1965. (Out of print, but available in large libraries.)

Bonsai Chrysanthemums: Growing, Training And Showing, Ted King. 3723 E. Castro Valley Blvd., Castro Valley, California 94546. (50¢). ☘

SUMMER IN THE CHILDREN'S GARDEN

LL, LR, oppos. LL, R: USDA. Others, BBG

Some 300 children each summer learn to grow vegetables in the Childrens' Garden at BBG. The program dates from 1914 and has been one of the most important contributions of the Garden to the wider community. Children take home vegetables but the true harvest is the human one.

Doing it faster and better . . .

DRYING FLOWERS IN A MICROWAVE OVEN

Grace Rymer

Reprinted from AMERICAN HORTICULTURIST, Fall, 1977

Drawing: William McCarthy; Photo: Author

A new miracle in the floral design world has come about with the use of microwave ovens. A microwave unit in your kitchen enables you to instantly dry flowers. This can save four weeks of ordinary drying time and produces fresher and more colorful materials for use in floral designs.

Preparation for microwave drying requires a supportive substance for flowers that wilt. This drying agent absorbs moisture so the flower can dry in its natural form.

I have found three drying agents to be most effective. First is Silica-Gel, available in most hobby shops. Second, an equal mixture of borax and corn meal can be used. A third agent which is inexpensive and easiest to use is "kitty litter." I recommend the Hartz brand. It has great absorbing quality and is made of ground clay. For smoother surfaces, such as an orchid or daisy, Silica-Gel is most satisfactory. All of these agents can be used over and over again.

Containers for drying can be any size and made of glass or paper. Dessert or cereal size bowls, shoe boxes and cardboard platters work fine.

Drying Flowers

Here is a step-by-step procedure:

1. Select fresh flowers or leaves you wish to preserve.

2. Select containers deep enough so the drying agent covers the entire bloom.

3. Place a ½ inch layer of the drying agent in container. Clip stem of flower about ½ inch long. Then place flowers in agent, face up. With a spoon, sprinkle granules of the agent gently between petals of flowers, making certain every petal

is covered and not bent out of shape.

4. After flowers are carefully covered by agent, slip dish into the microwave oven. Also place a cup of water inside the oven to provide moisture. Set timer for about 1-3 minutes, depending upon the particular flower. (Later on I'll explain how to estimate proper oven drying time.)

5. After flowers have been "cooked," remove from oven and leave in agent for at least 36 hours. When removing material from agent, gently tap the flower until all granules are removed.

6. One of the most important problems is storage of these beautiful blooms. Plastic shoe and garment boxes work fine. Place a thin section of styrofoam in the base of the boxes—then place flower head in position into styrofoam with a long corsage pin. Small bank pins or straight pins are sufficient for smaller flowers. These transparent boxes can then be stacked away until needed.

7. Stem sections can be added to the flowers when needed in design by using a florist wire 18" long, gauge #20. Floral tape the entire length, forming a loop on one end, then use a quick drying glue. Spread glue lightly over the circle and place flower into position. Cut the wires according to the length needed in your arrangement.

8. Occasionally after the flowers dry they become brittle and may shatter when placed in the design. A practical way to avoid this is by using a humidifier. Wave the flower through the steam until it then becomes pliable. After you place the flowers in the arrangement they will again become dry and retain the desired form.

Flowers dried in this manner are not as dry and perishable as flowers dried the old way. They feel and look more like fresh flowers.

Like everything else worth doing at all, drying flowers must be done properly to get the best results. All flowers should be picked just as they are reaching their peak of bloom. If picked past their prime, when they have already started to turn brown, flowers will continue the browning process. Nothing will successfully prevent this. Correct timing, therefore, is the first requisite.

When drying roses, use Silica-Gel. Carefully cover with the agent—sprinkle between each petal until completely submerged. Place in oven for 2½ minutes. Let these stand in the agent overnight. One or several roses can be dried at once—using the same timing.

When drying miniature roses and smaller flowers such as pansies, approximately 1½ minutes baking time is all that is necessary, with about 10 hours set-up time. Daisies, small dahlias, black-eyed susans, zinnias, marigolds, carnations, and small-type chrysanthemums again use 2½ minutes—with about 10 hours cooling off period. Large dahlias, peonies, Chinese peonies, large chrysanthemums, bake approximately for 3 minutes—and let stand in drying agent for about 36 hours.

Orchids should be baked in Silica-Gel for approximately 1½-2½ minutes—with set-up time of 24 hours.

Foliage

Leaves can be microwaved dry, particularly the beautiful ones of interesting color and texture that are available in the fall. Foliage can form the major part of winter arrangements, with just a few flowers used in the focal area.

To dry foliage, place a shallow box lid or platter in the bottom of the oven, next place a section of paper towel over the box, then start layering your leaves with paper towels. Use as many clean leaves as will easily go into the oven. Turn the microwave oven to 1½ minutes. When the bell rings turn leaves and towels completely over and repeat the process, giving a total of three minutes exposure. Remove branches when the leaves are dry and beautiful. No set-up time is needed—they are ready for placement in your design.

Magnolia branches and leaves, ferns of all types, camellia foliage—all may be dried by the same method and timing.

I think it is wonderful to discover a new use for the microwave oven and, at the same time, a new means of speeding up the process of the ever-popular dried flowers. Dried arrangements by this new method are as colorful as fresh flowers and, needless to say, the results are beautiful.

Let a lilac tell you when to plant corn or where to plant a fruit tree . . .

NATURE'S OWN WEATHER BUREAU

R. J. Hopp and M. T. Vittum

Reprinted from ORGANIC GARDENING AND FARMING, April, 1977

By observing certain plants methodically year after year and recording the dates when leaves first open in spring, when trees and shrubs begin to bloom, or when wildflowers appear, a useful pattern begins to emerge.

Trees, shrubs and other plants do not show their leaves or flowers at the same time, but rather in stages. If one species flowers earlier or later than usual in a particular year, we can expect other species to be early or late, too. If we know the sequence in which various plants burst into leaf or bloom, we may be able to predict, by watching an "indicator plant," when other events are likely to occur on the same plant, on another species, or in insects or other organisms.

Phenology

The study of such events is known as phenology. The term comes from a Greek word meaning to show or to appear. The growth stages of plants are called phenological events, similar to the periodic events in the animal kingdom, such as bird migration, animal hibernation or insect emergence.

The same phenological event doesn't happen each year on the same calendar day; rather, it's influenced by the weather. Temperature is usually the most important factor. From year to year, for example, buds on a particular lilac bush may open on dates as far apart as three to four weeks, depending largely on the accumulation of a certain amount of temperature or "heat" units.

Weather records (temperature, rainfall, humidity, wind, amount of sunshine) give a good idea of the overall climate or weather of a given area. But plants show us the total effect of the weather by acting as very sensitive living instruments that continuously integrate all weather factors, and in many respects they do a better job than standard weather instruments. What's more, they're cheaper. But we have to learn or relearn the art of how to read these living instruments.

Phenology, although the word was coined about 1850, is nothing new. Phenological calendars were in use several thousand years ago in China and ancient Rome to guide farming operations. Old-time New England farmers used to plant corn when elm (some said oak) leaves were the size of a squirrel's (some said mouse's) ear; by that time, the soil was warm enough for corn seeds to germinate.

Today some Montana farmers watch for the common purple lilac to begin to bloom; then they know they have ten days to make their first cutting of alfalfa to eliminate the first brood of alfalfa weevils. Long Island cabbage growers watch for forsythia flowers to alert them of the arrival of the adult of the destructive cabbage root maggot. We know that European corn borers emerge when arrowwood begins to bloom.

Some European countries have long recognized that phenological observations can be a useful addition to, or even a substitute for, meterological observations. They developed and maintain extensive networks for data collection in many places and on many different indicator plants as part of their national weather services, and this data is collected throughout the growing season. The information may be used, for example, to warn of expected outbreaks of plant diseases or of insect attacks, or to determine whether a certain crop is suited for cultivation in a particular region.

The U.S. doesn't have a unified national network. In 1904, the U.S. Weather Bureau established a limited phenological network, but abandoned it after only four years because Congress failed to provide enough money. As a result, most U.S. farmers and gardeners don't generally

L. Buhle

Syringa vulgaris
"Montaigne"

rely on phenological observations or calendars.

Since the mid-1950's, scientists at a number of agricultural experiment stations have become increasingly aware of the possibilities of phenology. Work began with a joint state experiment station-USDA project in the western states that soon spread to the midwestern and eastern states and into Canada.

Indicator Plants

With the help of several thousand cooperators across the two countries, scientists record the dates of the opening of leaf buds and flowering and fruiting stages, among other events, for indicator plants like the genetically identical "Red Rothomagensis" lilacs (*Syringa chinensis* cultivar), common purple lilac and two species of honeysuckle. This information has already been used for phenological maps and preliminary computer-calculated predictions of phenological events.

We all know about the general northward progression of plant growth stages in spring. The advance of this "green wave" averages out to about 100 miles a week—a little over a half mile an hour. But it does not move in a straight line; it is influenced by mountains, river valleys, large lakes, or proximity to the coast. If we draw lines on a map that connect points where the same phenological event takes place on the same date, these lines will be more parallel in the Plains states than in the mountainous east or west.

By checking phenological events on indicator plants growing at various spots on your property, you could discover that there are microclimates with significant variations in the collection of heat units—near a large rock or wall with a southern exposure, for instance. This could spell the difference between some plants setting fruit and some being consistently frosted out, especially up north.

In addition to the interregional and international projects, other local studies include the North Carolina project that uses flowering dogwood as the indicator species, the network of phenological gardens in Indiana, an extensive program conducted by the Wisconsin Phenological Society, and detailed observations of many species at the Minnesota Landscape Arboretum in Chaska, Minnesota, and at the Cornell Plantations in Ithaca, New York. ☘

Drought in California suggests ways for . . .

WATER CONSERVATION IN THE GARDEN

Robert D. Raabe

Adapted from PACIFIC HORTICULTURE, Fall, 1977

In a geography class nearly thirty years ago, one of the facts stressed by the professor was that water would be one of the first natural resources to be depleted if action were not taken to insure a conservative use of it. Though difficult to believe at that time, much of California and parts of some of the other western states are in just such a predicament. At our own house, we will have to reduce consumption about 80%. A number of approaches to water conservation are available. Many of them are applicable to saving water in the garden, not only in California but elsewhere, and some of them will be discussed here.

Methods of Watering

Of the various methods used in applying water, some use far less water than others. In brief, ditch irrigation uses the most water and should be avoided. Overhead sprinklers use less but may water areas where no plants are growing. Hand watering is probably the best, for the water can be put where it is needed. Also there is less tendency to overwater using this system as contrasted with systems where water is turned on and the device left to be re-positioned at some later time. Soaker hoses also can be used, particularly where plants are relatively close together. When used, they should be placed upside down so the water is not sprayed into the air, allowing for evaporation. Drip irrigation systems are excellent for conserving water and can also be used to water individual plants. Time, effort and expense need to be considered, but once in operation it is an easy way to irrigate. Although drip irrigation is most effective in sandy soils, it will conserve water even in the heavier clay soils.

Drought-resistant Plants

There are many lists of plants that can survive low levels of moisture, so most of these plants will not be included here. In general, the larger the plant, the larger the root system to explore for water and the less water it will have to be given. Certain plants such as California natives, most prostrate junipers and many plants native to South Africa and Australia do not need summer water. In the absence of winter rainfall, these plants should be watered in the winter when there is less demand for garden water. Shrubs with deeper root systems will need less water than those with surface root systems, such as rhododendrons, azaleas and camellias.

Perennials which can tolerate low moisture levels include columbine, hollyhock, geranium and other *Pelargonium* species, *Liatris* spp., *Rudbeckia* spp., candytuft, *Lychnis* spp., perennial poppies, some species of *Echium*, forget-me-not, coral bells, and plants from bulbs, corms or rhizomes such as freesia, narcissus, tigridia, gladiolus, agapanthus, watsonia, oxalis, amaryllis, cyclamen, iris, *Scilla* spp. and sparaxis. Ground covers such as ivy, ajuga, periwinkle, St. John's wort, *Duchesnea indica*, *Ceratostigma plumbaginoides* and ice plant can get by on small amounts of moisture. Some annuals which tolerate low moisture levels include sweet alyssum, marigolds, ageratum, petunias, annual poppies, nasturtium, annual candytuft, mignonette, fibrous begonias, calendula, valerian, portulaca, coreopsis and gloriosa daisies. From your own experience, you probably can add many to this list.

Weeding and Pruning

Plants are inefficient users of water and during daylight hours are constantly transpiring water through their leaves. Removal of weeds or any unwanted plants is extremely important. If time is too limited to pull the weeds, a hula or other type of scuffle hoe is suggested. These hoes have a long handle, on the end of which is a knife-like blade which can be pulled just beneath the surface of the soil to cut the roots and thus kill the plants.

Pruning small trees, shrubs and ground covers also will help. This is a good chance to prune overgrown or poorly-shaped plants. With some plants, it is important not to cut back too far or branches or whole plants may die. For example, when pruning bush daisies or fuchsias, do not prune beyond the last active bud. Once cuts have been made, new buds may be forced and additional pruning then can be done. Many plants can be cut back severely with little damage.

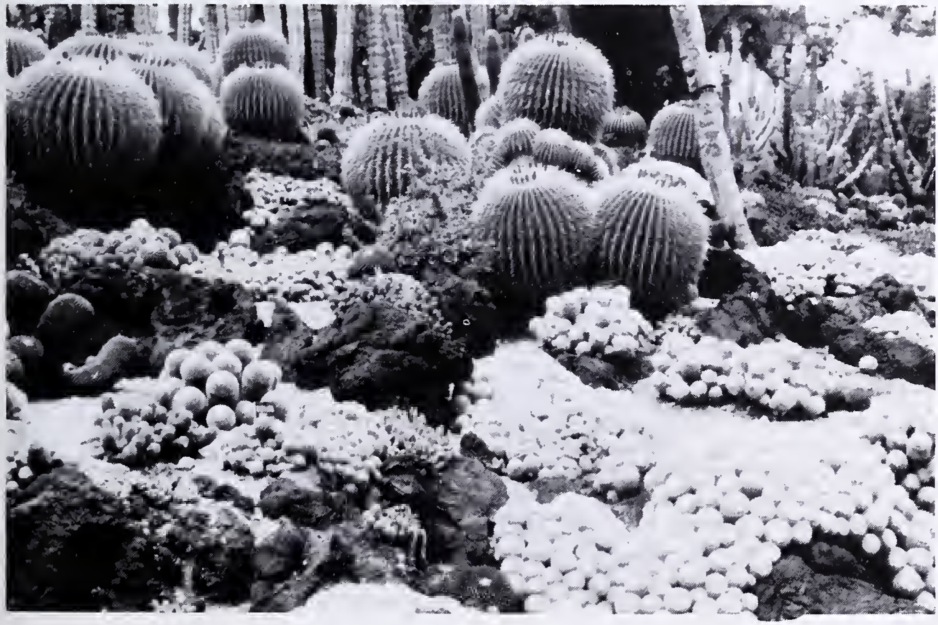
Removal of plants used as ground covers around other plants may be of help. For example, ivy, baby's tears or other ground covers sometimes are grown under shrubs such as rhododendrons, camellias, hydrangeas, etc. Such ground covers should be removed as far as the drip line of the shrubs so that water added for them will not be used by the ground covers.

Use of Organic Material and Other Cultural Practices

Organic material in the soil performs many functions, one of which is to retain soil moisture. Organic materials such as leaf mold, decomposed manures or compost can be worked into the soil. In addition, organic materials can be put on top of the soil as a mulch to prevent evaporation. Of the organic materials, compost may be the most readily available, for with the new, rapid, composting method, a new batch of compost can be ready for use in mild climates every three weeks. There should be no excuses for a lack of abundant compost to add to soils and to be used as a mulch around all plants.

There are a number of cultural practices that will help conserve water in addition to those already mentioned. These include such things as scooping the soil away from the bases of plants to make basins that will concentrate the water in the root zones. We have done this to all our rose plants and have filled the basins with compost to prevent evaporation. Plants that tend to be surface feeders can

Cacti at the Huntington Botanical Gardens (San Marino, Calif.) thrive in reduced moisture. In drought areas where they are hardy, succulent plants can side-step the problem.



not be treated this way, though a ditch can be made at the margin of the root system that will prevent runoff. On sloping land, soil, rock, brick or wood dams or barriers can be put in to prevent run-off.

Another practice is to lower soil levels of beds so they are not above sidewalks or driveways. This may not always be feasible but if not, the soil should be removed along the edge so that any water running off the bed will collect in the ditch which is formed.

When planting vegetable gardens, make ditches for the rows and then plant into these ditches. This will not only concentrate the water in the root zone and prevent evaporation loss but plants will be less exposed and will lose less water through transpiration.

If winds are a problem, plant rows of vegetables at right angles to, rather than parallel with, the wind. The erection of small windbreaks, even of cardboard, will help prevent some water loss through transpiration.

The use of rocks or boards as stepping places in the garden will also prevent evaporation from the soil which is covered. Layers of polyethylene plastic will do the same, but eventually it breaks down in the sunlight and must be disposed of. Compost is better as a mulch.

Concrete retaining walls frequently will draw moisture from the soil. This can be prevented by removing the soil from the wall and painting it with tar or asphalt emulsion. This however, raises the question of whether it is advisable to use one diminishing natural resource in order to conserve another.

Avoid growing plants in containers, for it takes more water to support plants with a confined root system than plants which can explore open ground. Some containers, in addition, are porous and there is evaporation from their surface. If plants must be grown in containers, change to plastic or glazed containers for they allow little evaporation. At the same time, remember that because such containers allow little air exchange, they need to be watched more carefully for they are more subject to excessive moisture and thus root rots may be more common.

Other cultural practices might include watering at night to prevent evaporation, mowing your lawn more frequently to prevent transpiration, and avoiding soil spading prior to planting because this not only destroys soil structure but allows excessive evaporation of soil moisture. Deep spading each year is helpful in removing roots of large trees near beds because roots tend to accumulate where water is available. Control slugs and snails, for extra water will be required to replace the growth damaged by such pests.

Use of Gray Water

Gray water, that is, water from the washing machine, dishwasher, shower, bath tub, lavatories or kitchen sink should be saved and used wherever possible. Some cities may forbid this and local regulations should be observed. The main problem from using such water is that detergents are sodium salts of various organic acids and soaps are sodium or sometimes potassium salts of certain fatty acids. Sodium is not used by plants and when it accumulates in soils, may reach levels where it is toxic to plants. Potassium also may reach toxic levels though it is used by plants and also plants are slightly more tolerant of potassium than of sodium in the soil. The use of gray water will depend on how much it is mixed with water not containing these materials. It will also depend on what plants receive it. Acid-loving plants should not receive such water. Monocots, particularly many of the grasses, seem quite tolerant of sodium. As an experiment, we are using only the first water from the washing machine to water our lawn. At such time as injury appears, gypsum will be added at the rate of 1 pound per 25 sq. ft. Gypsum contains calcium and it is more active than sodium so will replace it in the exchange reactions in the soil, thus releasing the sodium, allowing it to be leached. Fortunately, soils in this area tend to be high in calcium already and it may not be necessary to add gypsum.

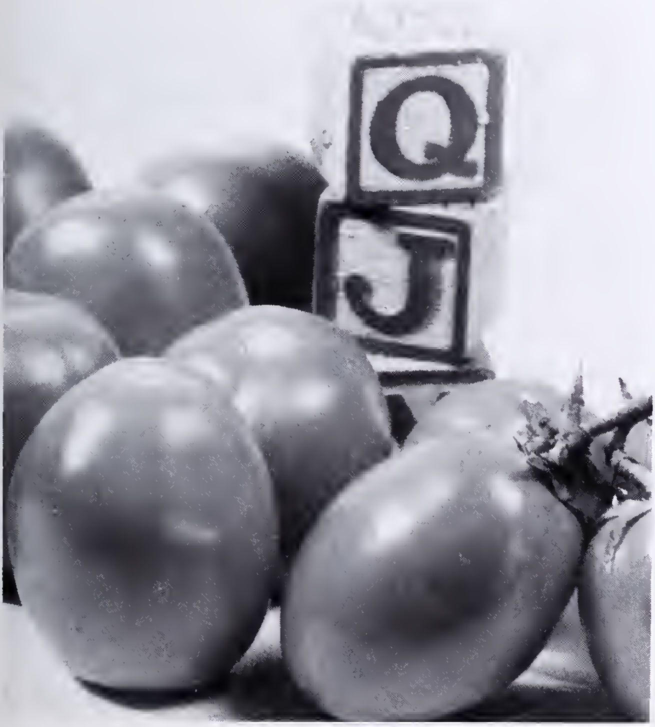
If planning to use gray water, do not use detergents or soaps that have boron, for an abundance of this material is very toxic to plants. If bleaches or materials containing bleaches are used, let the water stand in the open air one day before using it for irrigation. Bleaches are quite toxic but break down in the presence of light and air to form less toxic salts.

The main problems from lack of water are obvious. Other problems may also occur. The use of gray water or the lack of enough water to leach the soils may result in the accumulation of excessive salts in the soil and this may result in excessive salts in the plants. Salt damage usually appears as a killing and browning of the tissues around the margins of the older leaves of plants. Plants vary in their sensitivity to this. Salt damage is more likely to occur in container-grown plants than in those grown in open ground. Therefore, when using gray water, do not use it on plants in containers.

Benefits

Although it is sometimes difficult to find good in such a serious situation, some good will come of it. Some plants will have to go without water. Such plants as California natives and most of the prostrate junipers, as well as some of the plants from Australia and South Africa, will thrive far better than when they received too much tender, loving care. Already, one of the live oaks on the campus of the University of California, Berkeley, which was on its way out because of summer water, has started to show signs of recovery. One of the more important diseases in California is root rot of the prostrate junipers and particularly of the tams (*Juniperus sabina* 'Tamariscifolia'). It will be severely reduced as a result of the lack of water. This may even allow some plant pathologists to work on some new disease problems, maybe even some new ones which will result from the lack of water.

Ready or Not—The Square Tomato



Stokes Seeds, Inc.

Square (well, nearly square) tomatoes have been developed from the varieties used for sauce. With high solid content and a structural resistance to being squashed they travel extremely well, whether from field to processor or garden to kitchen.

An indoor gardener's guide to more shapely plants . . .

MANAGING YOUR HOUSE PLANT'S HORMONES

by Joyce G. Greene

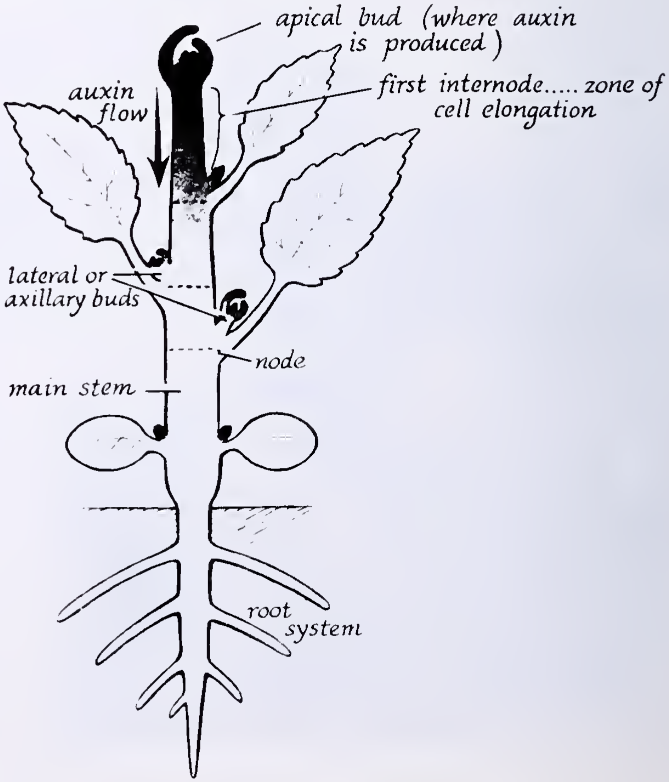
Reprinted from HORTICULTURE, November, 1977

In caring for house plants or garden shrubs you may occasionally pinch off their growing tips to promote bushier growth. You may also know that periodically turning house plants set by a window fosters more symmetrical growth. Gardeners learned such practices as these long before plant physiologists could explain them. But knowing why plants respond as they do can help you shape their growth more effectively.

The reasons why plants respond to pinching or turning have to do with plant hormones called auxins, a word of Greek origin meaning "to increase" or "to grow." These auxins are the chemicals responsible for regulating a plant's growth and flowering. Like our own sex hormones, they are required in only minute quantities to have an effect. They control a plant's growth in a variety of ways, regulating its height, its branching, and its root structure.

Auxins are produced in the growing tips and young leaves of a plant, where the cells are actively dividing, and flow down the shoot affecting the growth of lower parts. Understanding the normal course of this growth is the best guide to knowing when, and how, to take a

Originating in the apical bud of a plant, growth-regulating auxins flow into the stem, lengthening the first internode, and move down to stimulate formation of lateral buds and growth of roots.


apical bud (where auxin is produced)
auxin flow
first internode..... zone of cell elongation
lateral or axillary buds
node
main stem
root system

Drawings by Elmer Smith, Horticulture

hand in the process.

As auxins flow down into the region of the stem just below the growing tip, they stimulate the stem cells to grow longer. This causes a lengthening of the first internode, the part of the stem between the uppermost leaves, as is shown in the accompanying illustration. Lower along the stem (where the stem cells are already fully grown) the auxins have another effect, stimulating the growth of the lateral buds which form in the axil of each leaf along the shoot. At the base of the plant, auxins reaching the root zone stimulate the development of the root system. However, stems, buds, and roots each require different amounts of auxins for growth, and too high a level can actually retard rather than promote growth.

Stems require the greatest amounts of auxin for optimum growth. The buds are intermediate in their requirements, and the roots require the least. Thus, given the same amount of auxins, each part of the plant will respond differently. Auxin levels which promote stem elongation are too high for the growth of buds and roots, and will inhibit them. Auxin levels which enhance the development of buds are too low for stem growth and too high for the roots. And the low amounts of auxin that will promote root development are not enough to stimulate the stems or buds.

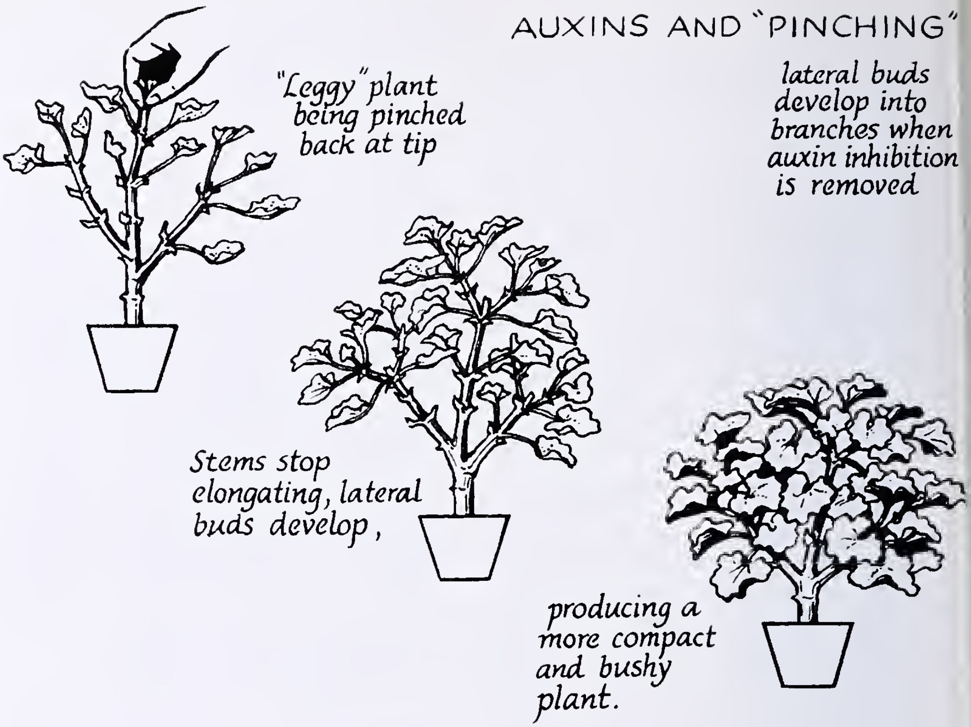
Ordinarily, the concentration of auxins decreases as the hormones flow down the shoot, so that each part of the plant is exposed to the amounts needed for some growth. The plant's growing tip or apex produces the largest amount of auxins, however, so that the apex grows more rapidly than the rest of the shoot. Pinching off the growing tip, or apical bud, and thereby decreasing the amount of auxins in the stem has two effects. It slows stem elongation, which makes the plant more compact and less "leggy." In addition, the decrease in auxin levels tends to stimulate the lateral buds between the leaves and main stem. At lower auxin levels they will sprout in profusion, which also adds to the bushiness of the plant.

To promote the development of many branches, however, all growing tips must be pinched off periodically. This is because each of the new shoots developed from the growth of the lateral buds will have its own growing tip and will produce an additional supply of auxins. The new shoots will elongate and their own lateral buds will be retarded. But if all their growing tips, too, are pinched off, this will form very compact, bushy plants.

Plants vary in the amount of natural auxin they possess. Plants which produce relatively large amounts in their growing tips are relatively tall and narrow, with short side branches. Their high auxin levels promote stem elongation but inhibit development of lateral buds. In contrast, plants which contain relatively low auxin levels are highly branched because their lower auxin levels promote more branching and less stem elongation. A spired spruce or fir tree, with high auxin levels, differs from a highly branched cottonwood or oak, which has lower auxin levels. The control of auxin over plant height is also seen in dwarf varieties of some plants, which have lower auxin levels than their normal cousins.

Environmental factors can also alter auxin quantities. Plants growing under severe conditions, for example, tend to be shorter and bushier than those growing in milder climates. In part, this is because late spring frosts and the winter winds may effectively prune growing tips, decreasing auxin levels and stem growth but increasing the bushiness of the plant.

While auxin normally moves down the stem from the apical bud where it is produced, the position of the plant stem in relation to light and gravity will influence the flow and distribution of auxin. Plants growing in a window, for example, tend to bend or grow towards the light. This phenomenon was first described by Charles Darwin in 1897 and is known as phototropism, from two Greek words—photo meaning "light" and tropism "to turn." Although plant hormones were unknown in the late nineteenth century, Darwin carried out some simple experiments that showed the stem tip to be important for this phenomenon. He illuminated parts of a plant from one side only. When only the tip was illuminated the seedling turned toward the light. Illuminating only the lower part of the stem this way, however, had no such effect.


AUXINS AND "PINCHING"
"Leggy" plant being pinched back at tip
Stems stop elongating, lateral buds develop,
producing a more compact and bushy plant.
lateral buds develop into branches when auxin inhibition is removed

This phototropic response occurs, we now know, because high light intensity destroys auxin. When plants are illuminated from one side, light causes an uneven distribution of auxin in the stem. The higher intensity of light on the illuminated side of the plant causes greater destruction of auxin on that side of the shoot. Thus the shaded portion of the stem has more auxin than the lighted side. Since stems need relatively high concentrations of auxin for growth, the cells on the shaded portion grow longer. This differential growth results in the stem curving toward the source of light. For this reason those plants growing by a window must be turned to foster symmetrical growth. Turning the plants will equalize the amount of auxin destroyed by light on all sides of the stem, causing the plant's growth to be even.

Because light tends to destroy auxin, the overall amount of light a plant receives affects its auxin level and growth. Plants grown in dim light will have more auxin than plants grown under high light intensities. The "leggy" appearance of plants grown in poor light is the result of these high auxin levels. The plants are taller with longer internodes—that is, they have a longer stem portion between leaves. As the amount of light increases, more auxin is destroyed. As a result, plants grown in good light will have shorter cells and shorter internodes, and a bushier appearance.

Plant hormones also affect a plant's ability to send its shoot upward and its roots down into the soil. If a potted plant is laid on its side or if a tree is blown down but is not completely uprooted, the stems will soon begin to grow upright and the roots will turn downward. This response to gravity is called geotropism, meaning "earth turning." Roots are "positively geotropic," growing towards the field of gravity, while stems are "negatively geotropic," growing away from the field of gravity.

The reasons for geotropic responses are

again found in auxin levels. Gravity causes auxin distribution to be greater on the lower side of stems and roots. As the lower side of a horizontal stem has more auxin, greater elongation of these cells occurs, causing the stem to curve upwards. The lower side of the horizontal root will also have more auxin than its upper surface. In roots, however, because of their greater sensitivity to auxin, these cells are inhibited in their growth rather than stimulated. Thus the lower side of the root will grow less than the upper side and the root will curve downward towards the field of gravity.

A plant's basic growth characteristics, which scientists describe as apical dominance, phototropism and geotropism, can all be explained by the action of the plant hormone, auxin. By knowing where auxin is formed, how it travels and how it will affect growth, you can understand the control it exhibits in plant development. And by learning simple procedures in handling house and garden plants you can influence their auxin levels, and their growth and general appearance as well. ⁂

Sex in the World of Higher Plants

Sex phenomena in plants long have been important to gardeners and orchardists as well as to biologists and, indeed, to most everyone interested in living things. As everyone knows, flowers are the "sexy" parts of plants. Stamens, the pollen-bearing organs, are considered the *male* portion of a flower and the stigma, pistil and ovaries (which bear egg cells) are *female*. Getting the sex cells of a flower together is the problem, and this is generally accomplished by wind or by insects. Thus, the transfer of pollen from the stamens to the stigma of a flower is the first step that leads to fertilization. Many kinds of flowers are self-pollinated.

In numerous plant families honey bees or other kinds of insects take care of this transfer—in which case it is called *insect pollination*. When gathering nectar to make honey, bees generally confine themselves to a single kind of plant at a time.

In other plant families, in which pollen is carried by the wind indiscriminately (*wind pollination*), there is so much of it that some of the tiny pollen cells are almost certain to reach the stigmas of flowers.

With this brief background information and without pursuing details or exceptions, here is a simplified classification of flowering plants, depending upon the sex of their flowers. Included are a few examples of method of pollination.

1) Those with *stamens and ovaries in the same flower* ("bisexual"). Botanists call these "perfect" flowers; there are more plant families of this kind than any other. Common examples of garden plants with bisexual flowers are petunias, snapdragons, iris, columbine, honeysuckle, tomatoes, hawthorn, raspberries and blueberries; also apples and other fruit trees.

2) Those with *separate male flowers and female flowers* ("unisexual") but *both borne on the same individual plants*. When flowers of the two different sexes are borne on the same plant, botanists say that such plants are *monoecious, i.e.,* a single "household" bears both kinds of flowers. Common examples are oak and birch trees, corn, melon and cucumbers (insect-pollinated); also sycamore, walnut, hickory and pine trees (wind-pollinated).

3) Plants with unisexual flowers (as in 2), but the *flowers of the different sexes borne on separate plants*. Botanists refer to such plants as *dioecious, i.e.,* two different "households." Common examples are shrubs and trees of holly (insect-pollinated), the ginkgo, most willows, date palm (wind-pollinated) and numerous others, such as bittersweet, bayberry, cat brier (*Smilax*), poplar, mulberry (sometimes monoecious, also), and fringe tree (*Chionanthus*).

In the case of plants which are dioecious there will be no fruit unless there is a male plant nearby. Holly is a good example. And it ought to be noted that a number of cultivated varieties of fruit-producing plants, apples for example, are self-sterile. In such cases it is necessary to plant more than one variety in order to get fruit. This fact also points up the importance of cross-pollination. Never underestimate the importance of the bees!

—*George S. Avery*

A revolutionary method to produce new varieties . . .

Hybridization Without Sex

Working with different species of tobacco, biologists of the 1970's have discovered a non-sexual method of hybridizing flowering plants. It is quite unrelated to the usual sexual phenomenon of fusion of sperm and egg that follows cross-pollination. It consists, rather, of the fusion of ordinary vegetative cells. The rather sophisticated method involves the aseptic removal of simple cells from the inner portion (*mesophyll*) of green leaves of two different species. Their cell walls are removed by enzyme digestion and the naked cells (*protoplasts*) are then brought together in an artificial culture medium where they fuse genetically and grow into small masses of undifferentiated tissue. Each such little blob of living tissue is called a *callus*, and when it grows to be about the size of a pea after 2 or 3 months in culture, it gives rise to roots and leaves. Thus a new kind of hybrid plant is "born"; and after 7 months, grown in soil, it reaches maturity and bursts into bloom.

Inasmuch as male and female parts of the flower are not involved in this experimentally new manner of reproduction, the scientists who carried out the work refer to it as *parasexual hybridization*.

The question arises whether hybrids thus produced are true hybrids. In support of this view: It so happens that when the same two species of tobacco that were involved in the discovery of parasexual hybridization are cross-pollinated in the usual fashion (*Nicotiana glauca* x *N. langsdorfii*), leading to sexual reproduction, the hybrid offspring bear characteristic tumorous growths. So do the parasexually produced hybrids! Thus true hybrids *are* produced by this method, a fact further substantiated by other research.

The parasexual method of cell fusion now has been carried out between different strains of the single species *Nicotiana tabacum;* also on petunia, and between species belonging to different plant families, *e.g.*, such unrelated forms as soybean and tobacco. But this is not all. Cell fusions also have been reported between yeast cells and certain cells of chickens. And even between certain human tumor-derived cells and those of tobacco and carrot.

In short, it is possible experimentally to induce cell fusion between completely unrelated forms of life in the plant and animal kingdoms. Yet, there is *no* evidence thus far that cell fusion between such totally unrelated forms leads to genetic "mixing" . . . in the sense of hybridization and subsequent production of some unusual or freak form of life. Thus, in spite of parasexual successes in opening and remarkably broadening biological vistas, and offering further support for the long held concept of cellular totipotency, the extent to which parasexual methods may be adapted to the production of new kinds of hybrid ornamental plants (above and beyond the potential of cross-pollination) remains for future research to determine.—*George S. Avery*

For *Plants & Gardens* readers interested in pursuing the somewhat complex methods of parasexual hybridization and the results obtained, please feel free to request a list of references to scientific articles. Address the *Editor.* ❧

People in Tennessee and elsewhere are . . .

GINSENG FARMING

Thomas E. Hemmerly

Adapted from Economic Botany, April-June, 1977

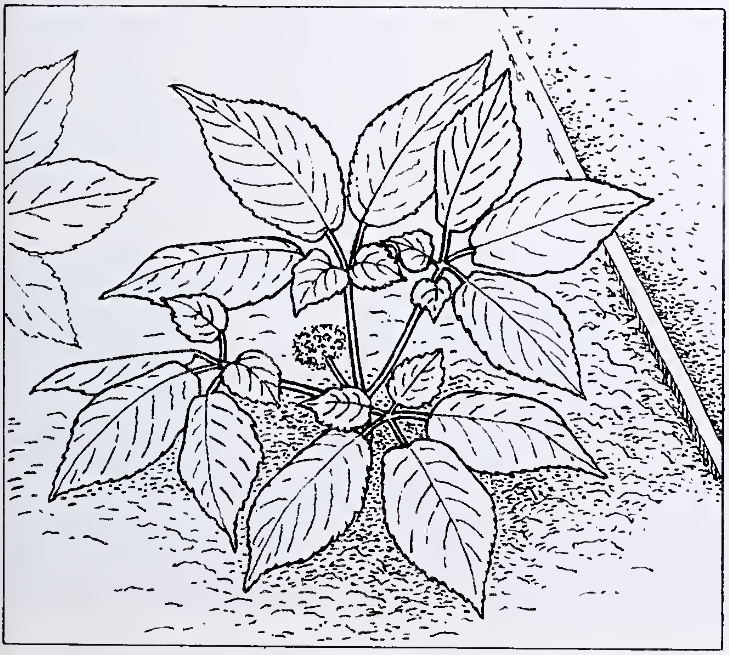
American ginseng (*Panax quinquefolium*) is a herbaceous perennial of the eastern hardwood forests of North America. Its range extends, especially in the Appalachian Mountains, into the southern United States. Because of their high market value, the roots have been collected since colonial times for sale to dealers who ship them to China and Korea. There, as a substitute for the much-in-demand Chinese ginseng (*P. ginseng*), they are used to make beverages and medicinal preparations. People of the Orient, and a growing number of westerners, believe them to be panaceas and aphrodisiacs. Some of the products, notably teas, make their way back to health-food stores in America.

Chinese ginseng has been held in highest esteem as a medicine in China for some 4,000 years. There exists a large Asian language literature on the pharmacological aspects of Chinese ginseng, and a number of active constituents are recognized, each of which has been found to have a specific effect on the human body.

Cultivation to Meet Demand

Because of the great demand and the dwindling supply of wild ginseng, the cultivation of the plant began several centuries ago in Manchuria, North Korea and Japan. In America, ginseng cultivation was started in the late 19th Century, in Wisconsin, Ohio, New York, Michigan, Virginia and Kentucky. Later, in the 1920's, cultivation outside the natural range for American ginseng included farms in Washington and Oregon. Such attempts to raise "sang," as the plant is often called, have met with various degrees of success. Unlike most crops, it requires shade and does not lend itself to field cultivation. Ginseng is also slow growing and is subject to fungus disease and rodent damage.

Following the Korean War, which



Eva Melady

Western physicians generally minimize the healing properties of ginseng but the Chinese and Koreans are strong believers.

ruined many Oriental ginseng lands, there was a renewed interest in ginseng cultivation and collecting because of consistently high prices. In America the three leading producers are North Carolina, Georgia and Tennessee. American ginseng, like its Chinese counterpart, has become an uncommon plant in many parts of its native range because of market collectors, so a closer look at an alternative, ginseng farming, is in order.

A Farm in Tennessee

Among the largest and most successful of American ginseng farms is that of Fred Markus of Lawrenceburg, Tennessee. Mr. Markus, with his sons, Jerry and John, cultivates about 5 acres of ginseng. The following is a description of the methods used by the Markus family:

Seeds, harvested at maturity in July and August, are stratified in damp sand (½ inch deep) for 18 months in a cool basement.

Seed beds are located on well-drained hillsides, and are prepared in loose soil containing rotted wood. The surface on each bed, 5-5½ feet wide, is several inches higher than the 1-foot walkways between. The beds are shaded by wooden laths, making a shed 7-8 feet high, designed to reduce the light intensity by 75%.

Following stratification, the seeds are sown in the fall or early winter, at a depth of 1 inch, at the rate of 140 pounds per acre. Germination occurs the following spring.

Care of the crop before harvesting involves the following: pulling of weeds by hand; frequent spraying of insecticides, especially in early summer; mulching with leaves (1 inch deep) in late fall after the shoots have died back.

In the fall of the fourth growing season, when the fruits have turned red and the shoots have become yellow, the roots are dug, using a potato digger. Drying of the roots was previously accomplished in the open air in the shade for 6 weeks but more recently in a specially designed oven at 90-95° F for 3 weeks.

Approximately 1-1½ acres are harvested annually with yields of dried roots as high as 3,000 pounds per acre. The roots are shipped by truck in barrels to New York, from where they are sent to Hong Kong. Current prices for the cured roots of cultivated ginseng are $25-$35 per pound. ❧

Old Weeds, New Uses

Many jump-about plants made the news in the past year as chemists, nutritionists and economic botanists explored ways to cope with shortages and to diversify food crops. Nobel laureate Melvin Calvin, a Univeristy of California (Berkeley) scientist, is studying caper spurge or mole plant (*Euphorbia lathyris*), which yields a hydrocarbon that might lead to a petroleum substitute (*Wall Street Journal,* Nov. 16, 1977.) This European annual or biennial has become naturalized in America. It is not new to the world of ersatz, having been used as a coffee substitute, too.

S. K. Jain and other workers at the University of California (Davis) have learned that the seeds of meadowfoam (*Limnanthes*) have properties similar to sperm-whale oil, now banned from import. The new substance could be employed to lubricate certain types of fine machinery (*Crops and Soils Magazine,* March, 1977.) *L. douglasii,* a pretty little West Coast annual, is sometimes offered by seed firms.

Searches for practical rubber substitutes are hardly new. For example, Thomas Edison once experimented with making tires from goldenrod. Because of the rising price of rubber, which costs the U.S. $500 million annually in imports, the National Academy of Sciences has been encouraging a new look at guayule (*Parthenium argentatum*), a shrubby member of the Composite Family that is native to deserts of the Southwest and Mexico. The latex it produces is similar to that of commercial rubber (*Hevea brasiliensis*). The Aztecs knew about

Carnegie Institute

Old rubber substitutes never die. In World War II the Government spent $30 million to develop rubber from guayule. After the War traditional imported rubber (*Hevea brasiliensis*) replaced guayule and 47 square miles of guayule were destroyed. Now that imports have risen to $500 million yearly, there is renewed interest in guayule.

guayule and played a form of basketball with a ball fashioned from its latex (*New York Times*, Mar. 30, 1977.)

To get quick energy for their basketball games, the Aztecs may have gobbled amaranth grains, too. Amaranth has received new attention thanks in part to the promotional efforts of *Organic Gardening and Farming* (August, 1976; December, 1977). Both the seeds and leaves of *Amaranthus cruentus* and *A. hybridus erythrostachys* (*A. hypochondriacus*) are high in useable protein, and a flour made from the seeds is said to be very palatable. Researchers C. M. Stowe, T. P. O'Leary and Thor Kommedahl (University of Minnesota, St. Paul) urge caution, however, because at least one species of *Amaranthus*, the common pigweed (*A. retroflexus*), is poisonous to swine and cattle, and they suggest that other species should be studied to determine possible toxicity (*Science*, Nov. 18, 1977.)

The native hog-peanut (*Apios tuberosa*) is one of many little known plants that may someday have a greater role in feeding people.

Here We Go Round The Prickly-Pear, Carefully

Ever wonder where the strange fruits come from that you see in gourmet shops and fancy supermarkets? One of them is the prickly-pear, a juicy, seed-filled cactus fruit which some adventurous gastronomes think tastes like nectar of the gods. Non-epicures compare it with slightly sweetened buckshot.

No one is quite sure where the prickly-pear (*Opuntia ficus-indica*) originated except that it is native to the New World, as are all true cacti. It has long been naturalized in the milder regions here and has made its way to other parts of the world, in many instances becoming a bad weed. Australians regard it as highly as they do sheep rustlers, South Africans hold it in the same esteem as diamond thieves—and people of the Mediterranean eat the fruits.

There is indeed a market for prickly-pears in the United States, especially in the eastern cities. James Curtis of UCLA reports in *Economic Botany* (April-June, 1977) that the Santa Clara Valley south of San Francisco leads the country in production of the fruits. Farming this unusual crop began in the Valley at the turn of the century when an Italian immigrant returned from a Sicilian vacation with propagating material. About 215 acres are now devoted to prickly-pears.

Harvesting is a spiny problem, and laborers resemble utility-company workers dressed for combat with downed power lines. Special leather clothing and goggles are a must because the plant is armed with hair-sized spines. On any given day in the harvest seasons (late spring and late summer) half of the men may quit despite relatively good wages. A greater threat to cactus farming is the increased price of land in the Valley. Annual gross profit per prickly acre is only about $550, not much of a return compared with housing developments. ⁂

Not just prickly-pear, but all cacti have edible (although not necessarily palatable) fruit.

RECENT BOOKS WORTH NOTING

In the Library of the Brooklyn Botanic Garden

(Please order directly from your bookstore,
not from the Botanic Garden.)

Gardening

Crockett's Victory Garden by James Underwood Crockett. Little, Brown & Co., Boston. Paperback $9.95

A month-by-month guide with the emphasis on vegetables, sparked by the author's television series (PBS).

America's Best Garden Flowers by D. Bruce Johnstone and Elwood H. Brindle. Burgess Publishing Co., Minneapolis. Paperback $4.95

Not necessarily. Showy annuals and some well-known perennials are singled out for attention. Culture, useful tables.

How to Grow Vegetables and Herbs from Seeds by Elvin McDonald. Mason/Charter Publishers, New York. Paperback $4.95

A Joy of Gardening by V. Sackville-West. Harper & Row, New York. Reprint. $7.95

A collection of gently disarming newspaper columns by one of England's leading gardeners of the 20th century.

Why Does Your Garden Grow? by William R. Van Dersal. Quadrangle/New York Times Book Co., N.Y. $8.95

Engagingly lucid presentation of basic botany for gardeners.

Wyman's Gardening Encyclopedia by Donald Wyman. Revised edition. Macmillan Publishing Co., New York. $19.95

Updating of a very useful single-volume reference.

Your Garden Homestead by Thomas and Betty Powell. Houghton Mifflin Co., Boston. $12.50.

A guide to self-sufficiency in the vegetable garden the "organic" way. Fruits, nuts and the indoor farm are also discussed.

Small Gardens

Miniature Gardens by Anne Ashberry. David and Charles, North Pomfret, Vt. $10.95

Sink and trough gardens, and plants for them. One chapter is on gardens for the elderly or disabled. A thorough, thoughtful treatment.

Backyards and Tiny Gardens by Judith Berrisford. Faber and Faber, Salem, N. H. Paperback $3.95

A British view, applicable perhaps to garden construction on this side of the Atlantic but not to plant selection.

Green Things in Small Spaces by Marnie Collins. Methuen, Inc., New York. Clothbound $9.95, paperback $5.95

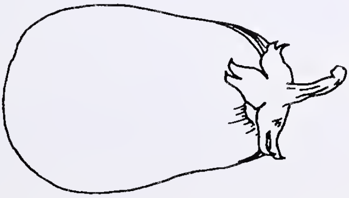
Apartment and balcony gardening. Mini-climates, light units, propagation, potting mixes.

Small Gardens for City and Country by Alice Recknagel Ireys. Prentice-Hall, Englewood Cliffs, N. J. Paperback $8.95

A well-illustrated introduction with concise text. The author, a landscape architect, discusses designs for different sites.

Gardening in the City by Carla Wallach. Harcourt Brace Jovanovich, New York. $8.95

Ingenuity helps. Useful advice concerning backyards and balconies. Designs, containers, plants, care.



Perennials

Perennials in Island Beds by Alan Bloom. Faber and Faber, Salem, N. H. $8.95

Lower maintenance and thriftier plants are the aim. The author, an English nurseryman, describes methods and lists selected perennials in this slim volume.

Perennials for Cutting by John Jeffreys. Faber and Faber, Salem, N. H. $10.95

There are not many books for both gardener and flower arranger, so this fills a gap. However, the unsuspecting American reader will look in vain for a number of the British cultivars mentioned.

Perennial Garden Plants by Graham Stuart Thomas. David McKay Co., New York. $24.95

The most comprehensive study of perennials in years. Many plants cited will be new to American readers, or known only in milder regions. The author is Gardens Consultant to the National Trust (Great Britain). Highly recommended.

Woody Plants

Trees and Shrubs Hardy in the British Isles, Volume III, by W. J. Bean. Revised edition. John Murray Publishers, London. Approximately $35.00

A massive, continuing reference work, proceeding alphabetically from *Nandina* to *Rhus*. Much of the volume is devoted to the large and complex *Rhododendron* genus.

Manual of Woody Landscape Plants, revised edition, by Michael A. Dirr. Stipes Publishing Co., Champaign, Ill. Hard cover $16.80, paperback $12.80

A welcome aid for home identification. Also landscape traits.

Fruits and Berries for the Home Garden by Lewis Hill. Alfred A. Knopf, New York. $10.00

Not the easiest form of gardening, but the author provides an enthusiastic and knowledgeable introduction for those who would like to try. Nut trees, too.

Special Plant Groups

Cactus Identifier by Helmut Bechtel. Sterling Publishing Co., New York. $4.95

Includes other succulents as well. Color photographs and descriptions.

Wildflowers and the Stories Behind Their Names by Phyllis Busch. Charles Scribner's Sons, New York. $9.95

Intended for children, but it will attract adults, too. The color paintings by Anne Ophelia Dowden are superb.

The Complete Book of Miniature Roses by Charles Marden Fitch. Hawthorn Books, New York. $12.95

An enticing hobby for an increasing number of gardeners who value small plants. Indoor and outdoor culture are covered, as well as different varieties.

Cacti and Succulents for the Amateur by Charles Glass and Robert Foster. Van Nostrand Reinhold Co., New York. Paperback $4.95

Fine introduction to a varied, fascinating group of plants, written by the editors of *Cactus and Succulent Bulletin.* Numerous good black-and-white photographs.

The Complete Handbook of Cacti and Succulents by Clive Innes. Van Nostrand Reinhold, New York. $16.95

A respected British collector gives concise, botanically useful descriptions of different kinds. There is also a section on cultivation.

Bulbs for the Home Gardener by Bebe Miles. Grosset and Dunlap, New York. $22.95

Big and small, and tender ones, too. History and culture. Top-notch color drawings by Judy Singer complement the fine text.

The Complete Book of Bulbs by F. F. Rockwell and Esther C. Grayson. Revised edition. Lippincott, New York. $10.00

An old favorite, updated by Marjorie J. Dietz, a former associate editor of *Plants & Gardens.*

Cultivating Carnivorous Plants by Allan A. Swenson. Doubleday, New York. $7.95

Venus flytraps, pitcher plants and their lesser known kin are discussed with admiration by a seasoned commercial grower.

Pelargoniums of Southern Africa by J. J. A. van der Walt. Purnell and Sons, Cape Town, South Africa. Illustrated. Approximately $17.00

Herbs and Herbals

An Illustrated History of the Herbals by Frank J. Anderson. Columbia Universsity Press, New York. $16.95

A scholarly account of early herbals and the people who wrote them. The copious line drawings from old works are attractively reproduced.

Cooking with Flowers by Zack Hanle. Price/Stern/Sloan Publishers, Los Angeles. $3.95

Recipes for day-lilies, marigolds, violets, etc.

A History of Herbal Plants by Richard Le Strange. Arco Publishing Co., New York. $15.00

Extensive introduction to plants used at various times in healing, and their lore. About 300 line drawings by Derek Cork illustrate the meaty text.

The Book of Kudzu by William Shurtleff and Akiko Aoyagi. Random House, New York. Hard cover $10.00, paperback $4.95

What to do in the kitchen with the vine that ate the South. Kudzu is a versatile plant, but people below the Mason-Dixon Line are not as apt to appreciate its qualities as the authors do. A "macrobiotic" approach.

Indoors

Your Window Greenhouse by John Bracken. Thomas Y. Crowell Co., New York. $8.95

How to build it, what to grow. Well illustrated.

Water Gardening Indoors and Out by Reginald Dutta. Crown Publishers, New York. $10.00

What to do with the fish tank after the fish have gone. Also brief chapters on water-lilies, patio pools and hydroponics.

Flowers When You Want Them by John James. Hawthorn Books, New York. $10.95

Forcing plants mainly in greenhouse and coldframe for out-of-season bloom. The author, a commercial grower, includes a chapter on forcing branches of hardy shrubs indoors. Bulbs, too.

The Greenhouse Catalog of Catalogs edited by Saul Lapidus. David McKay Co., New York. Paperback $7.95

Just what it says it is. Original catalog listings of major manufacturers.

How to Grow House Plants from Seeds by Elvin McDonald. Mason/Charter Publishers, New York. Paperback $4.95

From *Abutilon* to *Zantedeschia*.

Stop Talking to Your Plants and Listen by Elvin McDonald. Funk & Wagnalls, New York. Hard cover $8.95, paperback $4.95

One of the masters of indoor gardening discusses, with humor and knowledge, what 50 kinds of suffering house plants would say if they could talk.

Plants from 9:00 to 5:00 by Frances Tenenbaum. Charles Scribner's Sons, New York. $7.95

Plastic greenery is being replaced in offices by the real thing. A brief guide on the natural jungle for suffering secretaries.

Plant Propagation

North Carolina Native Plant Propagation Handbook by North Carolina Wild Flower Preservation Society. Available from the Society, Totten Center 457-A, UNC-CH, Chapel Hill, N.C. 27514. Paperback $3.50 postpaid

A handy little manual for all native-plant gardeners in the East.

Simple Propagation by Noel J. Prockter. Third edition revised. Charles Scribner's Sons, New York. $8.95

The principles described in this British work apply to American conditions, though the timing may vary. Major types of propagation are described in detail, with a helpful plant list and methods of increase.

Nature and Geography

The Golden Circle by Hal Borland. Thomas Y. Crowell Co., New York. $8.95

A naturalist's year, month-by-month. Anne Ophelia Dowden's color paintings add considerably to the sparse but poetic text.

In the Deserts of This Earth by Uwe George. Harcourt Brace Jovanovich, New York. $14.95

Deserts make up a good part of the earth's surface and are on the increase, but we know rather little about them. Their plant and animal life is discussed in passing, along with other things, by a German naturalist. Good bedside reading.

Endangered Plants by Dorothy Childs Hogner. Thomas Y. Crowell Co., New York. $6.95

Grown-ups remember the American elm, but will the children? In this book for young people the author tells about some plants included in the Endangered Species Act (1973).

Mediterranean Plants and Gardens by Vicomte de Noailles and Roy Lancaster. Floraprint Ltd., Calverton, Nottingham, England. Approximately $10.00

Botanical vacationers in Italy or Greece will delight in the many excellent color photographs and brief descriptive text.

Coffee-table

Health Plants of the World by Francesco Bianchini and Francesco Corbetta. Newsweek Books, New York. $19.95

A very attractively illustrated synopsis of medicinal plants.

Wildflowers by Mary Ferguson and Richard M. Saunders. Van Nostrand Reinhold, New York. $19.95

Mainly a pictorial volume with succinct notes on about 150 American plants. The color photographs by Mary Ferguson are of remarkably high quality.

The Power of Plants by Brendan Lehane. McGraw-Hill, New York. $39.95

A big, elaborate volume notable mainly for its 800 color illustrations, many of which are striking.

Miscellaneous

The Poetry of Flowers, edited by Samuel Carr. Taplinger Publishing Co., New York. $7.50

Selections from Keats, Wordsworth, Dickinson, Hardy and others.

The Country Diary of an Edwardian Lady by Edith Holden. Holt, Rhinehart and Winston. $14.95

A charming facsimile of a gardener's diary for 1906. Poetry and drawings in abundance.

The Green Thumb Directory by Marion Schroeder. Doubleday, New York. Paperback $3.95

Source guide.

Paperback Reprints

Orchids for the Outdoor Garden by A.W. Darnell. Dover Publications, New York. $6.00

The Picture Book of Annuals by Arno and Irene Nehrling. Arco Publishing Co., New York. $3.95

The Picture Book of Perennials by Arno and Irene Nehrling. Arco Publishing Co., New York. $3.95 ❧

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